

SCIENCE

[Entered at the Post-Office of New York, N. Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

SEVENTH YEAR.
VOL. XIII. NO. 321.

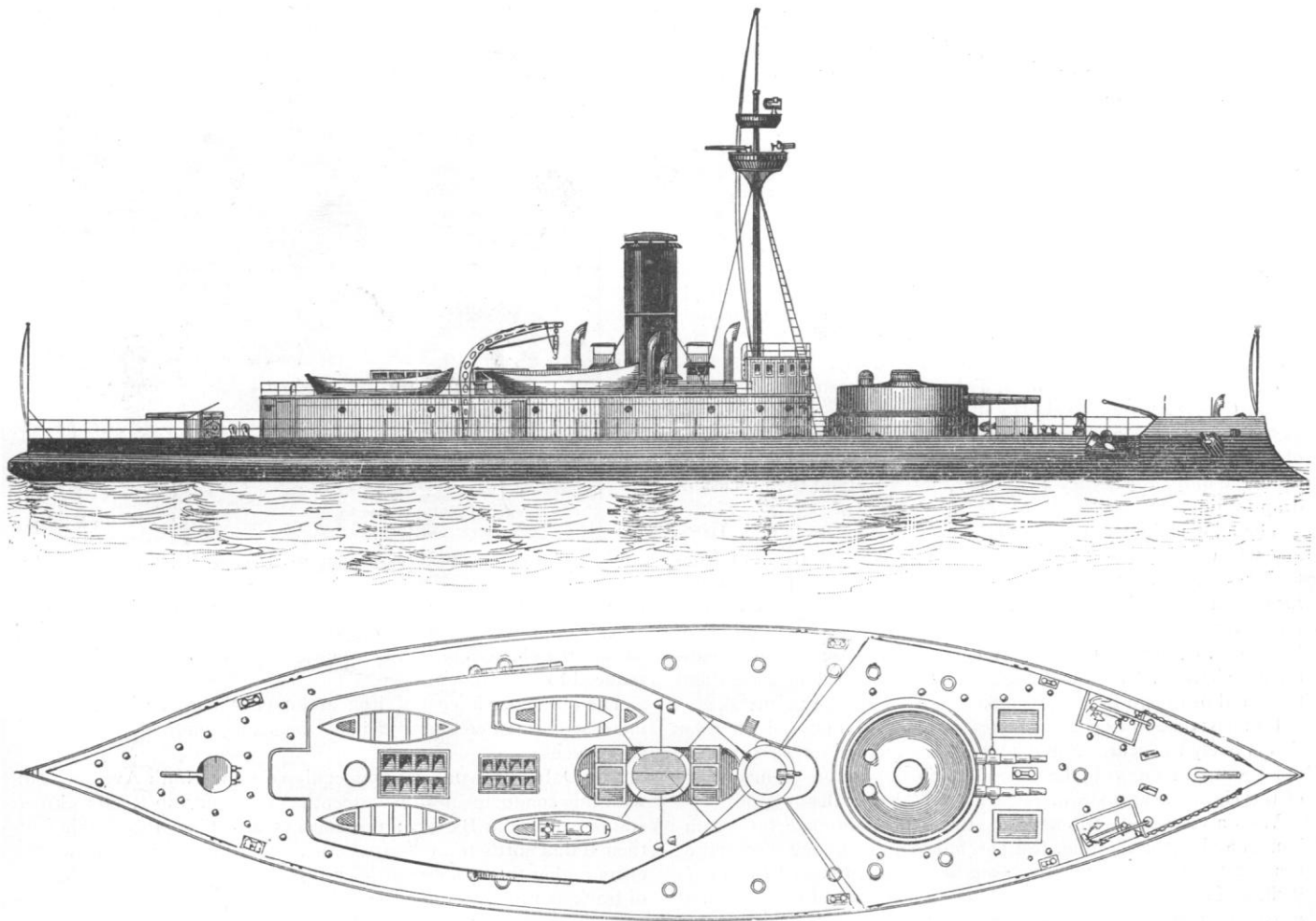
NEW YORK, MARCH 29, 1889.

SINGLE COPIES, TEN CENTS.
\$3.50 PER YEAR, IN ADVANCE.

THE SUBMERGING MONITOR CRUISER.

THE calls for models and designs of battle-ships and other war-vessels issued at various times by the Navy Department have resulted in the collection of many valuable plans and much data that will tend toward the construction of a navy of which the country may justly feel proud. Among the designs submitted that possess some novel features is that of Hon. J. R. Thomas, United States Representative from Illinois. It is intended in this vessel to com-

This cruiser is 235 feet in length, with a beam of 55 feet. She displaces 3,030 tons on a draught of $14\frac{1}{2}$ feet. One great point to be observed by war-vessels intended for service on our coast is that of keeping the draught as small as possible, in order to insure the entry of these vessels into our ports on the south-eastern seaboard and the Gulf coast, many of which are so shallow that the heavy class of armored vessels at present afloat cannot enter. In this vessel the trouble has been overcome in a very great measure by keeping her draught inside of 15 feet. Her 7,500 horse-power



THE SUBMERGING MONITOR CRUISER.

bine large powers of offence and defence on as small an amount of displacement as is possible, recognizing that the efficiency of an armored vessel intended for ocean or coast purposes is to be measured by the disposition and character of her armament, the ability to use it in all reasonable weather, the protection afforded by the armor, the rate of speed both going ahead and turning, her cruising capacity without recoaling, and her habitability.

promises a speed of 17 knots, which may quite possibly be increased before the final plans are approved. The main battery consists of two 10-inch breech-loading rifles mounted in a turret, armored with 10 inches of steel plating. There is, in addition, a 15-inch Zalinski dynamite gun capable of throwing 800 pounds of high explosive at any distance within a range of two miles. There are two under-water bow torpedo-tubes, and a 6-inch rapid-fire gun on

the after deck. To these are added several rapid-fire guns of the smaller calibers, placed at the most commanding positions about the vessel. Her single military mast, in addition to the armored top, carries a powerful search-light mounted on an upper platform.

To give as great an armor protection as possible on a very limited displacement, the armor has been disposed in the form of an arc of a circle, turning downwards at the sides to four feet below the fighting-line. The armor on the crown is three inches in thickness, increasing to five inches at the sides. In order that the target presented to an enemy may be as small as possible; ballast-tanks have been provided capable of holding enough water to lessen the cruising freeboard three feet; so that the hull target exposed, in still water, will be represented by a segment of a circle, rising from zero at the water-line to four feet above at the centre of the vessel.

Particular attention has been paid to the subject of water-tight compartments, and the appliances for readily freeing them from water, both in case of accident and for restoring her to the normal line of floatation.

The ram bow with which this vessel is fitted, the speed that she is calculated to attain, and her handiness, all combine to render her a formidable and valuable addition to our seacoast defences, while her coal capacity, and ability to remain at sea at a 10-knot speed for over a month without recoaling, make her of the highest service as a cruiser.

Great care has been bestowed on the subject of light and ventilation below. A complete electric plant, comprising lights, fans, and blowers for ventilating, with all modern improvements, will undoubtedly do away with many of the ills that prevailed aboard former types of low-freeboard ironclads.

TOBIN BRONZE.

THIS alloy, manufactured by the Ansonia Brass and Copper Company, New York and Chicago, is attracting attention on account of its high elastic limit, tensile strength, toughness, and uniform texture. When rolled hot, the tensile strength of the bronze has been found to be greater than that of mild steel, certain tests showing for the bronze an average tensile strength of 79,600 pounds per square inch, and for steel 65,630 pounds; the elastic limits being 54,257 pounds and 36,510 pounds respectively.

Further, at a dead red heat, Tobin bronze can be forged and stamped as readily as steel. It is maintained by those who have experimented with and tested different kinds of metals with a view of determining their utility for forgings, that they find Tobin bronze to be the only bronze they have tried that will stand the process of drop-forging.

The alloy is lighter than copper, can be worked well in a lathe, and when finished has a bright golden color. Its freedom from blow-holes, durability, and anti-frictional properties adapt the bronze for use on all bearing surfaces; while its lightness, in addition to its great tensile strength, and resistance to the corrosive action of sea-water, renders it a suitable metal for condenser-plates, steam-launch shafting, ship sheathing, etc. When rolled in sheets and tempered or drawn in wire, it makes an excellent spring metal.

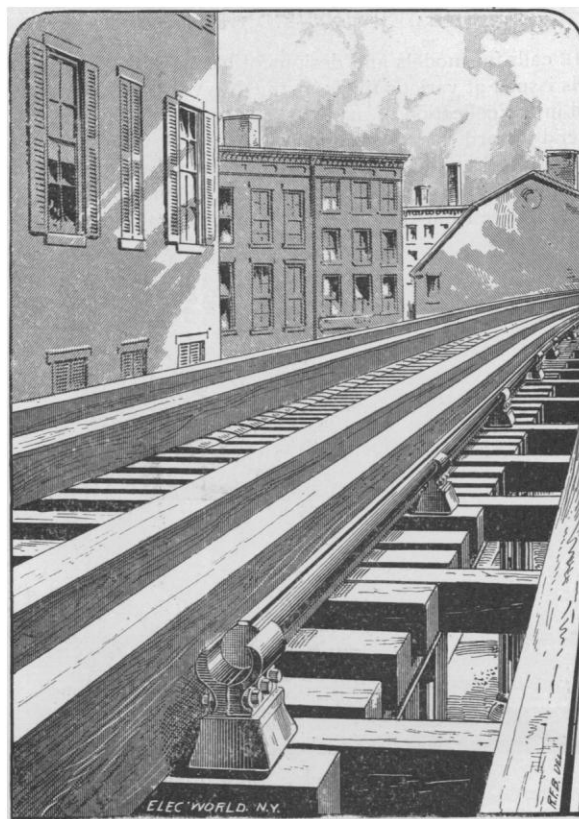
Its resistance to oxidation makes it a useful material wherever this is likely to occur. Some interesting experiments on this very point were made with the bronze by the inspectors of machinery of the United States steamers "Concord" and "Bennington."

With a view to determining its torsional endurance for steam-launch and yacht shafting, test specimens an inch long were cut at random from three-fourths-inch hot rolled rods, reduced to half an inch, and subjected to a torsional test in comparison with the best quality of machinery steel selected by Professor J. E. Denton, professor of experimental mechanics at Stevens' Institute, and tested by him on Thurston's autographic testing-machine. The results were as follows: average load at end of one-foot lever, which strained samples to elastic limit, for bronze 328 pounds, for steel 340 pounds; which ruptured samples, for bronze 633 pounds, for steel 711 pounds.

Another notable quality—its non-liability to give forth sparks—makes it invaluable for gunpowder machinery and gunpowder tools of every description.

A LARGE ELECTRIC-CURRENT CONDUCTOR.

A NEW departure in current conductors for electric-railway purposes has been taken by the Daft Company, who are now operating trains on a section of the Ninth Avenue Elevated Road in this city. The new kind of conductor is shown in the accompanying picture, which is a view on the road mentioned, looking south from Fourteenth Street. The conductor, which is supported by heavy insulated cast-iron brackets, runs along outside the outer guard-rail of each track. It is of round iron, three inches in diameter, and is surmounted by, and in perfect electrical contact with, a bar of phosphor bronze three-eighths of an inch thick by one inch wide. This bar takes all the wear from the contact apparatus, and will retain a polished surface under all circumstances. The supporting bracket is made in two parts, as may be seen in the illustration, and has a grip sufficient to prevent all possibility of displacement



NEW DAFT CONDUCTOR, NEW YORK ELEVATED ROAD.

of the conductor. The conductor is elevated a considerable distance from the ties, and the supporting brackets are well insulated, so that the chances of loss of electric energy through leakage are reduced to a minimum.

The difference in cost of iron and copper admits of the greatly increased size of conductor, giving the same conductivity at much less expense.

The Daft Company are now equipping the Ninth Avenue road with this conductor from Fourteenth Street south to Rector Street station, near the Battery; the success attending the running of their trains north from Fourteenth Street during the past winter encouraging them to extend operations and equip a greater length of track as rapidly as possible.

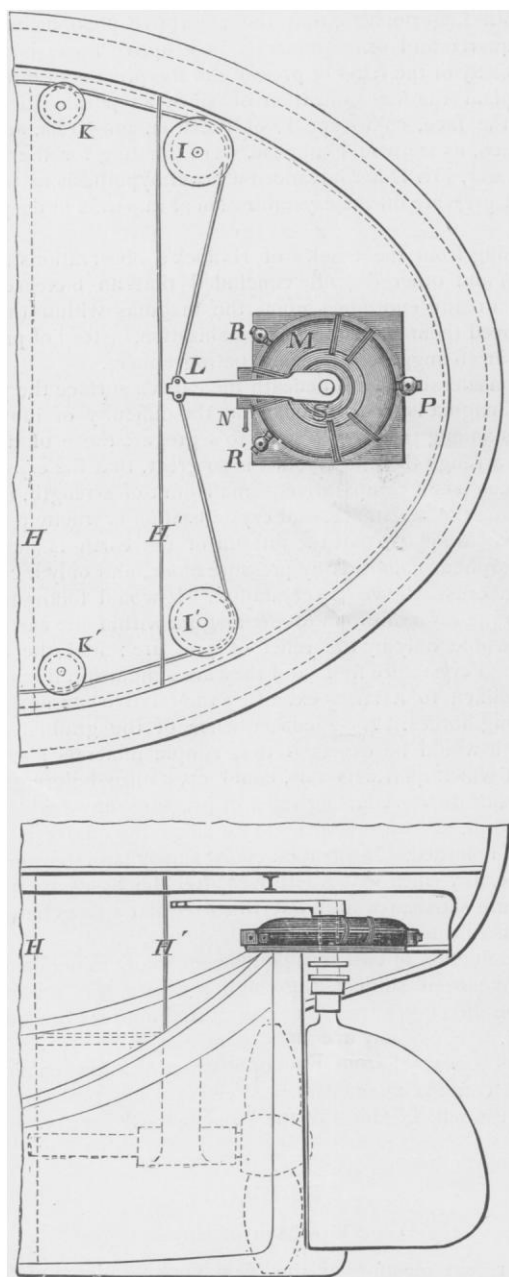
A METEOROLOGICAL EXHIBITION.

SEVERAL months since, the New England Meteorological Society, following the annual custom of the Royal Meteorological Society of London, decided to hold a loan exhibition in Boston in connection with its fourteenth regular meeting. The exhibition was opened in the physical laboratory of the Massachusetts Institute of Technology, Jan. 15, and was continued seven days. Among those who sent apparatus were Mr. Rotch from his Blue

Hill Observatory, the United States Signal Office, Harvard College Observatory, the Institute of Technology, the Boston Water Works, and the Draper Manufacturing Company of New York. Owing to the generous response to the circular requesting the loan of articles, particularly by the United States Signal Service, the exhibition was a success, and was so well attended by visitors that it was continued three days longer than was originally intended. Now that the feasibility of such an exhibition has been demonstrated, it is to be hoped that others will follow, as there can be no doubt of their effect in stimulating the study of meteorology.

THE HORNIG DIRECT-POWER STEERING SYSTEM.

THE steering system herewith illustrated is the invention of Julius L. Hornig of Jersey City, N.J. It may be operated by steam, hydraulic, or pneumatic pressure, the last being preferable. The motor is attached directly to the rudder-head, as shown in the

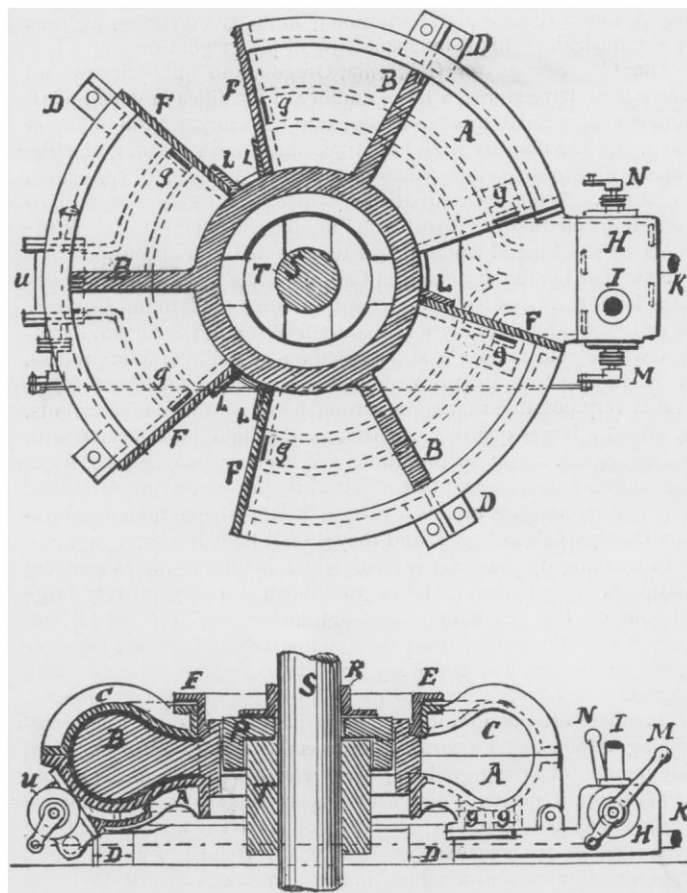


FIGS. 1. AND 2.

illustrations, though a special form of the motor is made which may be placed in any convenient part of the vessel, connecting with the rudder by chains, ropes, or rods.

The motor is shown at *M* in Figs. 1 and 2, the usual tiller, *L*,

not being removed, so that the vessel may be steered by hand if necessary. In fact, either hand or power steering may be done, or both at once, as neither system interferes with the other. *I* and *K* are guide-pulleys for the usual tiller-ropes. *R, R* are relief-cocks, and *P* is a regulator-cock for the brake.



FIGS. 3 AND 4.

The motor has three pistons, working in an annular chamber, as shown in Figs. 3 and 4. *A* and *C* are the bottom and top cases of the chamber; *B*, the pistons; *D*, the legs by which the motor is secured to the deck; *g*, the ports; *H*, the valve-chest; *I*, the inlet-pipe; and *K*, the outlet-pipe. *M* is a lever for working the regulator-valve *U*, and *N* is the main valve-lever. *S* is the rudder-head; *T*, the motor hub; and *F*, the end covers or abutments.

The reason for preferring pneumatic pressure to operate the motor is that liquids have practically no elasticity, and may freeze, while steam will condense. Air, on the other hand, is subject to no change; and its elasticity makes it an excellent cushion to receive the shocks of wave-blows, thus relieving the mechanism from sudden strain. In 1886 two boards of naval experts, acting under government instructions, made trials of pneumatic steering-gear, and reported its superiority over other methods.

The pressure-valve, which is operated by the lever, as shown in the cut, regulates the action of the pistons by supplying pressure to one side while relieving that on the other, or *vice versa*; while the pistons and rudder will remain stationary when the valve is kept closed. The motor may be controlled from any part of the vessel by any of the usual mechanical methods or by electrical transmission.

PROFESSORS AYRTON and PERRY announce that Messrs. J. W. Queen & Co. of Philadelphia, Penn., are alone authorized to sell their electrical measuring instruments in the United States and in Mexico, and all instruments sent to America which have satisfactorily passed their tests will bear the firm's name on them as American agents, as well as being accompanied by a certificate of accuracy.

PLATINUM.

THE *Engineering and Mining Journal* calls attention to a renewed demand during the last year or so for crude platinum, or "platinum sand," and gives a summary of the localities where the metal can be found in this country. There are so many localities in this country where it has been found, that it seems reasonable to believe that a regular platinum-mining industry may at some time be established, perhaps, independently of placer gold-mining.

The placer mines of California, Oregon, and other States and Territories, have shown a large number of localities in which platinum occurs. Small lots have come into the market from many of them, and the number would doubtless have been greater had the miners known that the crude metal could be sold in very small quantities. While aware that their "black sand" contained platinum, it seemed hardly worth while to take the trouble to collect the ounce or so of metal which might be obtained at a clean-up.

Now that hydraulic mining in California has received such a setback from invidious legislation, the quantities of platinum found, or to be found, are naturally less than before. Still the known localities, where gold-mining is still carried on by the hydraulic process, or by sluicing from drift or cement mines, are not few.

It is very possible that some arrangement of the undercurrents, by which a larger quantity of black sand would be collected with the amalgam, might be profitable. Whenever grizzlies are used, the addition of screens, placed below, might be an improvement. The platinum grains are, as a rule, in better shape for concentration than particles of gold, and they do not flour like amalgam.

In cleaning up the main line of sluice in placer mines showing platinum, if pains were taken to collect a comparatively large amount of the heavy material, — "black sand," etc., — this, together with the savings from the undercurrents, might be run over some mechanical concentrating apparatus, such as a vanner, with a production of platinum which would pay for the extra trouble.

But there are possibilities of finding platinum in other than gold-mining regions. Of course, wherever the metals occur together, any method of saving gold by gravity will also result in the saving of platinum, if present; and when amalgamation is the principal dependence, as in ordinary sluicing, still gravity is mainly relied on, even if plates are also used, to hold or to catch the amalgam, and therefore any platinum which may be present. It may be, however, and very probably too, that there are localities which have been prospected for gold and abandoned as unprofitable, which would furnish platinum in commercial quantities. The association of the two metals is by no means a necessary condition. That they are in practice found together, simply means that a gravity process which saves the one saves also the other. It is therefore worth while for prospectors exploring new fields to keep an eye open for platinum.

The same journal is authority for the statement that within the last few days a noteworthy discovery has been made: platinum has been found *in place* in the nickeliferous ore of Sudbury, Canada, by Professor F. W. Clarke. This discovery was made accidentally, in the course of determinative and analytical work upon the ore, which presents other peculiarities. While the amount found is of little or no commercial importance, it has a very great scientific significance, and is certainly something new. Platinum grains have been found in secondary rocks, such as recent sandstones, conglomerates, etc.; but never before, so far as we are aware, in vein stuff, although it has long been looked for, and such an occurrence was to be expected. There is therefore always the chance that actual veins of platinum-bearing material, so often falsely reported, may actually be found, and that perhaps some of them may be of a paying grade. The number of localities, and their wide distribution, in this country, point to such an outcome.

THE HISTORY OF PORPHYRITIC QUARTZ IN ERUPTIVE ROCKS.

In a very suggestive communication with the above title, presented to the Philosophical Society of Washington, Saturday evening, March 16, Mr. J. S. Diller emphasized the distinction first clearly drawn by Rosenbusch between granitic and porphyritic quartz in eruptive rocks.

Granitic quartz, he remarked, is the last mineral to solidify, as may be well seen in such rocks as granite, where it fills the angular spaces between the crystals of feldspar and other silicates.

On the other hand, porphyritic quartz is characterized either by a well-developed crystallographic outline or by rounded or embayed forms derived from such crystals by the corrosive action of the molten lava in which they were suspended. The destructive forms are by far the most common, and their distribution indicates that porphyritic quartz crystallized in the magma at great depths beneath the earth's surface before the majority of the silicates with which it is associated were formed. Mr. Diller laid special stress on the fact, that, while the silicates are crystallizing in a molten mass, if porphyritic quartz is present it undergoes resorption; and not until the silicates are developed, and granitic quartz begins to form, does the resorbent action discontinue.

Mr. Iddings was quoted as having shown that the crystallization of porphyritic quartz is not determined by the chemical composition of the magma, but due to physical conditions; and the speaker agreed with Lagorio, also, that the resorptive phenomena of porphyritic quartz and other minerals in eruptive rocks is a consequence chiefly of the relief of pressure in the process of eruption.

To explain the crystallization of silica as porphyritic quartz, right in the face, so to speak, of the iron, magnesia, and other bases which, as we would suppose, were thirsting for the silica to form silicates, Mr. Diller advanced a novel hypothesis as to the influence of pressure on the crystallization of minerals in deep-seated magmas.

Reasoning from the results of Hallock's observations (*Science*, xi. p. 152) and other data, he concluded that an increase of the pressure, already enormous, upon the magmas within the earth, only removed them further from crystallization, instead of producing it, as has been suggested by some petrographers.

At a considerable depth beneath the earth's surface the pressure upon the magma is so enormous, and the difficulty of moving the molecules among themselves so as to segregate those of a certain kind and arrange them in crystals is so great, that the crystallizing force, which has a comparatively small limit of strength, is unable to overcome the resistance, and crystallization is wholly prevented. Thus it would appear that the interior of the earth is maintained in an amorphous condition by pressure alone, and only a comparatively thin crust allowed to crystallize. It would follow from this view that the crystallization of the magma within the earth is rendered possible only by the relief of pressure; and the minerals which could crystallize first (and they are similar in all lavas) must be determined to a large extent by the relative strength of their crystallizing forces. As a consequence of the gradual relief of pressure, it would be expected that simple minerals such as the oxides, of which quartz is one, could crystallize before the more complex silicates. A further relief of pressure may enable the silicates to form, and, in the struggle for silica, the quartz is partially or wholly resorbed. If the rock cools slowly, and becomes holocrystalline, any silica that is left over after the bases in its neighborhood are satisfied will fill out the irregular spaces between the crystals of silicates, and form granitic quartz.

The production of twinning lamellæ in many minerals, of rocks which have been subjected to high pressure, was regarded as a step in the direction of reducing crystallized matter to an amorphous condition.

The full paper, which is only an abstract of a forthcoming bulletin of the United States Geological Survey, will probably be published in the "Proceedings of the Philosophical Society."

ETHNOLOGY.

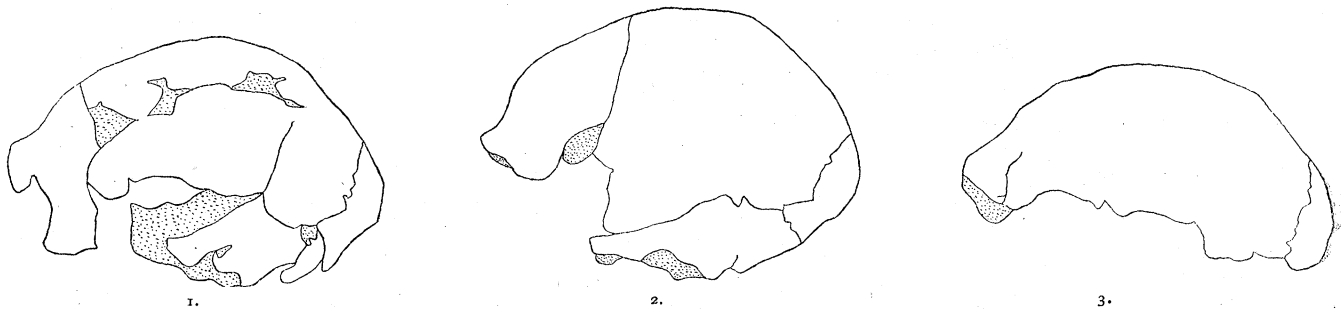
The Man of Spy.

At a recent meeting of the New York Academy of Sciences, Professor J. S. Newberry described the important finds of human remains in a cave at Spy in Belgium, which were made in 1887, and illustrated his lecture by interesting photographs of the crania and other portions of the find. Since the discovery of the Neanderthal man, no other discovery of equal importance has been made; the more so, as Messrs. Ed. van Beneden and Ch. van

Bambeck, who have submitted the remains to a careful and thorough examination, arrive at the conclusion that the man of Spy, that of Neanderthal, and that of Canstadt were of the same race, and possessed certain characteristic features which they consider as pithecoïd. The following figures are taken from the report of these gentlemen, and show that there really exists a striking similarity between the Neanderthal and the Spy skulls. The authors sum up their researches on the anatomical character of the remains as follows: "To sum up, we believe that we can advance the opinion, founded solely on the anatomical character of the man of Spy, that he possessed a greater number of pithecoïd features than any other human race. These features are the following: the superciliary arches and the frontal sinus are strongly developed; the forehead is low and retreating; the occipital prominence is large; the region of the chin is of very small size; the marked prognathism and the central elevation of the row of teeth, beginning at the canine teeth; the curvature of arm and leg; the small size of the tibia; and the bearing of the man when standing upright." The authors add that these peculiarities are far more exaggerated in the anthropoid apes than in the case of this man. The other features of skull and body are entirely human.

"Between the man of Spy and the ape there is still an enormous

J. Ranke sums up the interesting history of this skull as follows: "It is remarkable how rapidly and completely the views expressed after the first discovery of the skull were refuted. Although we are unable to concur with Darwin's views, who called the Neanderthal skull well developed and capacious, the researches of Virchow, Spengel, and others proved that the general form of the cranium — chamæcephalic dolichocephalic — was widely spread in ancient and modern times in the region in which the skull was found, but especially in Friesland. At the Anthropological Congress of Brussels, Dr. Hamy maintained that he had seen in the streets people with skulls of the same type. Other scientists had seen similar shapes of skulls in various parts of Europe. Virchow proved that a number of the peculiarities of the skull under discussion were due to pathological processes. At a young age the Neanderthal man had been afflicted with rachitis: in old age he had suffered from gout. The latter seems to have been very frequent at this period, and may have been due to life in the damp caves. Cave bears have been frequently a prey of the disease. Besides this, traces of various lesions are found. Virchow sums up his views, saying that the whole form must have been modified by these pathological processes, which he describes in detail."



1. SIDE VIEW OF CRANIUM FROM SPY, NO. 1; 2. SIDE VIEW OF CRANIUM FROM SPY, NO. 2; 3. SIDE VIEW OF NEANDERTHAL CRANIUM. (1-6 NATURAL SIZE.)

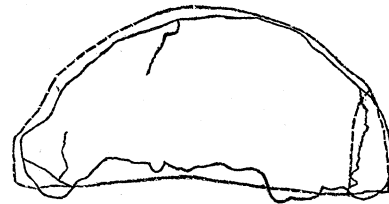
gap. In comparing the race of the Neanderthal to those which have made their appearance later on, — that of Cro-Magnon, the race of Furfooz, the neolithic races, and those of the present time, — we observe that the pithecoïd features have diminished constantly, and that they disappear one after another. Some of them may still be found in one or the other of the lowest races: they may re-appear by atavism individually among Europeans. It might well be that such a feature could re-appear more prominently than it does in the case of the man of Spy; but the grand total of so great a number of pithecoïd features is impossible except in the case of the most ancient race known up to this time. Besides this, we believe we have shown that the Chélléan man, the predecessor of the man of Neanderthal and Spy, who led a nomadic life without shelter and habitation, who chipped the paleolithic flints, the contemporary of *Elephas antiquus* and *Rhinoceros Merckii*, is unknown to us so far as his anatomical character is concerned. The manufacture of the pliocene stone implements of Montapert, of the upper miocene in Italy, of the upper miocene of the Tagus valley in Portugal, are also unknown to us.

"If the most ancient ethnic type that is known to us was capable of assuming modifications during the quaternary sufficient to give rise to races of as different a character as those of Cro-Magnon and Furfooz, if during this period it could lose numerous inferior features and gain others instead, it is not difficult to assume that pliocene man was far inferior to the man of Spy. It is true, the distance separating the man of Spy from the recent anthropoids is enormous, but it is smaller between the same man and the *Dryopithecus* of the middle miocene of St. Gaudens; but, on the other hand, the ethnic type of the man of the lower quaternary had to be modified considerably to assume the character of the present races, if he really was their ancestor."

Although the authors' views will not remain unchallenged, the results of their thorough measurements are well worthy of a careful consideration. But it will be well to remember the history of the famous Neanderthal skull, which was, when first discovered, believed to be much more pithecoïd than the men of Spy are now described.

Regarding another skull of the same age, that of Engis, which is classed with the skull of Neanderthal, Huxley says that it might well have been that of a great philosopher.

These facts make us loath to accept unhesitatingly the views expressed by the Belgian authors. Skulls are known from the Old World as well as from the New World, which, if found in a position suggesting old age, would be classed with these undoubtedly early quaternary skulls. The figures reproduced above are unfortunately not orthogonal tracings, but outlines of photographs. Orthogonal views make the crania appear considerably higher, as may be seen from the following figure, showing the Neanderthal



skull in solid lines as drawn by Huxley by means of the camera lucida, while the broken line is a geometrical (orthogonal) projection made by Th. Lanzert.

The fortunate find of Spy contributes materially to the final solution of the ethnic character of the early races of Europe, and is a most welcome supplement to the finds of Neanderthal.

BEANS CULTIVATED IN PREHISTORIC ARIZONA. — A number of years ago Mr. Wittmarck expressed the opinion that our bean (*Phaseolus vulgaris*) was not a native of the Old World, as was usually assumed, but that it was an American plant. This view, which was founded on finds made in Peruvian burials, was later on confirmed by researches of Körnicke, Asa Gray, and Hammond Trumbull. Recently Mr. Wittmarck has discovered seeds of the bean among the excavations of the Hemenway expedition in

Arizona, which were exhibited by Professor Edward S. Morse and Sylvester Baxter during the recent Congress of Americanists at Berlin. This discovery confirms the American origin of the bean. The plant called *phaseolus*, *faseolus*, etc., in antiquity, is, according to Körnicke, *Dolichos chinensis*, or a variety of the species *D. melanophthalmos*. Mr. Wittmarck has found also seeds of the pumpkin in ancient Peruvian burials, and concludes that the pumpkin is originally an American plant. The so-called pumpkins of the Bible are, according to Ascherson and Magnus, melons (*Cucumis Chate L.*), and so are those represented on ancient Egyptian paintings. On the other hand, Gray and Trumbull have proved that before the arrival of the Europeans, pumpkins were used as far north as northern New York.

ELECTRICAL NEWS.

Electrical Lines of Force.

THIS subject was brought before the members of the Royal Institution, London, some years ago by Mr. Gordon; and recently a lecture was delivered on the same subject at the institution by Professor A. W. Rücker, an abstract of which appears in *Nature* of March 7. In the interval a considerable amount of work has been done upon it, both in England and Germany, and many experiments have been devised to illustrate it. Some of the more striking of these, though of great interest to the student, are rarely or never shown in courses of experimental lectures. The lecturer and Mr. C. V. Boys, F.R.S., last year devised a set of apparatus which has made the optical demonstration of electrical stress comparatively easy, and most of the results obtained by Kerr and Quincke can now be demonstrated to audiences of a considerable size. Before discussing this portion of his subject, the lecturer introduced it by an explanation of principles on which the experiments are founded.

Magnetic lines of force can easily be mapped out by iron filings, but the exhibition of electrical lines of force in a liquid is a more complex matter. In the first place, if two oppositely electrified bodies are introduced into a liquid which is a fairly good non-conductor, convective conduction is set up. Streams of electrified liquid pass from the one to the other. The highly refracting liquid phenyl thiocarbamide appears to be specially suitable for experiments on this subject. If an electrified point is brought over the surface, a dimple is formed, which becomes deeper as the point approaches it. At the instant at which the needle touches the liquid the dimple disappears, but a bubble of air from the lower end frequently remains imprisoned in the vortex caused by the downward rush of the electrified liquid from the point. It oscillates a short distance below the point, and indicates clearly the rapid motions which are produced in the fluid in its neighborhood. When the needle is withdrawn, a small column of liquid adheres to it. This effect is, however, seen to greater advantage if a small sphere about five millimetres in diameter is used instead of the needle-point. When this is withdrawn, a column of liquid about five millimetres high and two millimetres in diameter is formed between the sphere and the surface. A similar experiment was made by Faraday on a much larger scale with oil of turpentine; and he detected the existence of currents, which are in accord with the view that the unelectrified liquid flows up the exterior of the cylinder, becomes electrified by contact, and is repelled down its axis. In view of this explanation, and the movements assumed can be clearly seen in the phenyl thiocarbamide, the performance of the experiment on a small scale is not without interest. The possibility of the formation of such violent up-and-down currents in so small a space must depend upon a very nice adjustment between the properties of the liquid and the forces in play. It is obvious that such movements of the liquid must be a disturbing element in any attempt to make the lines of electric force visible.

Again: if a solid powder be suspended in a liquid into which electrified solids are introduced, it tends to accumulate round one of the poles. This subject has been investigated by W. Holtz. Sometimes the powder appears to move in a direction opposed to that in which the liquid is streaming. Sometimes two powders will travel towards different poles.

If powdered antimony sulphide be placed in ether, it settles at the bottom of the liquid; and if either two wires insulated with glass up to their points, or two vertical plates, be used as electrodes, on exciting them slightly the solid particles arrange themselves along the lines of force. If the electrification be increased, they cluster round the positive pole. On suddenly reversing the electrification by means of a commutator, they stream along lines of force to the pole from which they were previously repelled. Other methods of obtaining the lines of force have been devised. They can, for instance, be shown by crystals of sulphate of quinine immersed in turpentine.

The tendency of the lines of force to separate one from the other was illustrated by Quincke's experiment. A bubble of air is formed in bisulphide of carbon between two horizontal plates. It is in connection with a small manometer, and when the plates are oppositely excited, the electrical pressure acting at right angles to the lines of force, being greater in the liquid than in air, compels the bubble to contract.

Kerr's experiments depend upon the fact, that, since the electrical stress is a tension along the lines of force, and a pressure at right angles to them, a substance in which such a stress is produced assumes a semi-crystalline condition in the sense that its properties along, and perpendicular to, the lines of force are different. Light is therefore transmitted with different velocities, according as the direction of vibrations coincides with, or is perpendicular to, these lines; and the familiar phenomena of the passage of polarized light through crystals may be imitated by an electrically stressed liquid.

The bisulphide of carbon used must be dry, and, to make the phenomena clearly visible, it is necessary that the light should travel through a considerable thickness. Thus, to represent the stress between two spheres, elongated parallel cylinders should be used, the axes of which are parallel to the course of the rays of light. These appear on the screen as two dark circles. Between crossed Nicols, the planes of polarization of which are inclined at forty-five degrees to the horizontal, the field is dark until the cylinders are electrified, when light is restored in the space between them.

If parallel plates with carefully rounded edges, and about two millimetres apart, are used, the colors of Newton's rings appear in turn, the red of the third order being sometimes reached. If one plate is convex towards the other, the colors of the higher orders appear in the middle, and travel outwards as the stress is increased. The experiments may be varied by using two concentric cylinders, or two sheets of metal bent twice at right angles to represent a section through a Leyden jar. In the first case a black cross is formed; and in the second, black brushes unite the lower angles of the images of the edges of the plates. By the interposition of a piece of selenite, which shows the blue of the second order, two of the quadrants contained between the arms of the cross become green, and the others red. In like manner the horizontal and vertical spaces between the inner and outer coatings of the "jar" become differently colored.

There are several phenomena connected with the stress in insulators which present considerable difficulties. Thus in a solid it is found impossible to restore the light between crossed Nicols by a uniform electrical field. That the non-uniformity of the field has nothing to do with the phenomenon in liquids, though at first disputed, is now generally admitted. It may be readily proved by means of a Franklin's pane, of which half is pierced into windows. The glow is much weakened by thus removing part of the uniform field, though it is thus made much less uniform.

Again: though most dielectrics, when placed in an electric field, expand, the fatty oils contract. Professor J. J. Thomson has recently pointed out that this indicates that another set of strains are superposed upon those assumed in the ordinary explanations of these phenomena, and by which they may be neutralized or overcome.

In experiments with carbon bisulphide it is necessary to take every precaution against fire. For this purpose the cell which contains the liquid should be immersed in a larger cell; so that if, as sometimes happens, the passage of a spark cracks the glass, the liquid may flow into a confined space. This should stand in a tray

with turned-up edges, and an extinguisher of tin plate should be at hand to place over the whole apparatus. No Leyden jars should be included in the electrical circuit. The difficulties which formerly arose in the exhibition of experiments in statical electricity, owing to the presence of moisture in the air of a lecture-room, are now immensely reduced by the Wimshurst machine, which works with unfailing certainty under adverse conditions. A new and very beautiful machine was kindly lent by Mr. Wimshurst for the purposes of the lecture.

ARC-LAMP FOR INCANDESCENT CIRCUITS.—The Silvey Electric Company, Lima, O., claims to have the only arc-lamp that can be depended on at all times for incandescent circuits. In this lamp it is impossible to cross the carbons or cause a short-circuit. The lamp has a rack feed-rod fed by a mechanism which makes it impossible for the carbons to approach each other more than one two-hundredth part of an inch at a time, thus maintaining the light steady at all times, while it is impossible for the two carbons to drop together. The light may be turned on or off at will, and the company guarantee the lamp to burn perfect upon any system of incandescent lighting, and to not interfere with the incandescent lights. Persons having incandescent machines often want an arc-lamp or two for yards or large open places. This lamp meets this want, and is arranged to burn on the Edison, Mather, Thomson-Houston, United States, and other incandescent machines. It takes the same amount of power as ten incandescent lamps, giving a return of two thousand nominal candle-power. A patent was issued to William L. Silvey, March 5.

DYNAMO-DESIGNING.—At a meeting of the Engineers' Club of St. Louis, March 20, Professor Nipher addressed the club on "Plans of Investigations in Dynamo-Designing." His remarks were illustrated by numerous drawings, and by formulæ and sketches on the blackboard. He explained in detail the principles involved, and showed how, when certain constants for any type of dynamo had been ascertained, the design of dynamo of the same type of any other desired capacity could be readily determined. He had recently made such a calculation for an Edison dynamo, which he used as an illustration. He gave two empirical formulæ for the safe carrying capacity of a wire in ampères. The cost of copper necessary in any dynamo, and the speed at which it could be run, were usually determining factors in the problem. Another important consideration is the resistance which the space around the dynamo offers to the magnetic line. It would be very desirable to have experiments made to determine this resistance for the prominent dynamos now in the market.

THE MAGNETIC ACTION OF DISPLACEMENT CURRENTS IN A DIELECTRIC.—Professor S. P. Thompson read before the Royal Society a few weeks ago an interesting paper on displacement currents. That there is an electric displacement in the dielectric of a condenser when the coatings are charged, and that any variation of this displacement causes effects analogous to those of ordinary electric currents, are points that have been indirectly proved by several experiments, notably those of Hertz. Thompson attempted at first to prove it directly by observing the effect on an astatic needle suspended near the edge of a condenser, of charging the condenser or of discharging it. But, as calculation showed that the effect would be too small to be observed, he adopted a different method. An iron annulus wound with a coil of fine wire was embedded in a layer of paraffine between two glass plates which were coated with tinfoil. The displacement passes through the iron ring, and any changes in the displacement should set up lines of magnetic induction in it; and these would cause currents in the fine wire circuit with which it was wound. The condenser was connected with an induction-coil; the fine wire, with a telephone. When the induction-coil was working, sounds were heard in the telephone, and it is held that this proves the existence of displacement currents. The method is extremely simple and ingenious; but one is led to ask if the reasoning that deduces from the experiment the existence of displacement currents does not depend on assumptions no better proved than the phenomenon experimented on.

PATENTS ON ALTERNATING-CURRENT TRANSFORMERS.—Some months ago the validity of the Gaulard and Gibbs patents in

England suffered an adverse decision of the courts, and the decision has just been affirmed by the Court of Appeal. In this country the Gaulard-Gibbs patents are held by the Westinghouse Company; and, although decisions of English courts do not by any means allow us to infer how the same case would be decided here, yet the result could not but be a blow to that company. As an indirect result of the trial, however, the Jablochhoff patents have been brought prominently forward; and as it is understood that the Jablochhoff patents in this country are owned by the United States Electric Lighting Company, and as the United States Company is controlled by the Westinghouse, the position of the latter corporation is not materially weakened by the English decision. M. Jablochhoff had granted him in 1877 a patent, of which one claim read as follows: "The use in apparatus for the production of electric light, of induction-coils, interposed in a primary electric circuit for generating separate and independent currents, to be used for producing electric light in one or more lamps interposed in such secondary circuits substantially as herein described." It is understood that the owners of the English patents have made arrangements with some of the leading electrical manufacturing concerns in that country by which the latter have been granted licenses under the patents.

THE TESLA ALTERNATING-CURRENT ELECTRIC MOTOR.—Almost a year ago Mr. Tesla read before the Institute of Electrical Engineers a paper on alternating-current electric motors, in which he described a motor of his own invention, which embodied several novel and ingenious features. The great novelty of the invention consists in the fact that the revolving armature is not connected with any external source of supply, but has currents induced in its coils by the variations of the magnetic field. The motor attracted a great deal of attention at the time, and its performance was enthusiastically praised. Professor W. A. Anthony made tests of the motor, but the only datum he gave was, that, "at 6,400 alternations, over one horse-power can be obtained at an efficiency of 62 per cent." As the measurement of the efficiency of such a machine would be extremely difficult, embodying some novel methods, and as no details of the methods employed or of the weight or speed of the motor were given, we can hardly consider Professor Anthony's statements as very satisfactory, and now we are again disappointed. A Tesla motor was sent to the Central Institution in London, and we had hoped that some tests would be made and published; but the only information so far obtained is a statement of Professor Ayrton that the motor gave .63 horse-power with 3,720 alternations at a speed of 3,200 revolutions,—quite an impractical speed for a commercial machine. The Tesla motor has been taken up by the Westinghouse Company, and there is no doubt that neither energy, nor money, nor talent are being spared to develop it. There is no doubt that it will work, and there is little doubt that it offers some advantages. At present it labors under the disadvantages of not being applicable with an ordinary alternating-current system, of requiring three wires instead of two, and of being possibly not so light or as efficient as a corresponding continuous-current motor. In a short article on the subject, the London *Electrical Review* concludes: "The weight of material used in a Tesla motor must be several times as much as that necessary for a continuous-current motor to give the same output, rendering such machines very costly. Thus it would appear that alternating-current motors are a long way off from the ideal goal, in spite of the strenuous efforts on the part of some of the smartest people in the world; and we are inclined to think that the solution of the problem may yet have to be sought in an entirely different direction." This is rather gloomy, and is hardly consistent with the fact that the subject has made rapid strides in the last year, and gives promise of an early solution of the whole question.

THE BIRMINGHAM ELECTRIC LOCOMOTIVE.—This locomotive is used for exceptionally heavy tramway work, and was designed to take the place of the steam-engines now in use. The motor weighs a ton, and the current for it is supplied from 100 storage-cells, weighing together four tons and a half. The cells are subdivided into four groups, which can be used either four in parallel, two in series, two in parallel, three in series, or four in series. The motor is suspended beneath the car, and is geared directly to both

of the axles. Some trials were made to determine the tractive force of this locomotive. It was coupled directly to one of the ordinary steam-locomotives of the Birmingham Tramway Company, and set to haul the latter. The brakes on the steam-locomotive were then gradually tightened until it was brought to rest, when the spring balance indicated a pull of a ton and a half; the current through the motor at that time being 200 ampères. Previous trials on the line had shown that the maximum pull was required on a six-per-cent grade, where it amounted to 1,800 pounds: so the electric locomotive has a margin of over 50 per cent of tractive power above that actually required in the ordinary working of the line. While it is to be hoped that the experiments in Birmingham will succeed, yet storage-batteries have hardly reached that state of perfection that they can compete, as far as expense goes, with steam-engines. While it is still a very doubtful question whether they are more economical than horses for street-car work, it would seem a mistake to bring them in direct competition with steam.

THE DIMENSIONS OF ELECTRICAL UNITS.—Professor Fitzgerald, in a note communicated to the Physical Society of London, calls attention to the fact that the dimensions of the electric and magnetic inductive capacities are the same, being the inverse of a velocity, the one differing from the other only by a numerical coefficient. This, Professor Fitzgerald thinks, is very suggestive, and seems to have been hitherto overlooked. He thinks that the two quantities must be proportional to the reciprocal of the square root of the mean kinetic energy of the ether.

A NEW DYNAMO.—Messrs. Fritsche and Pischon of Berlin have brought out a new wheel-armature dynamo which gives some remarkable results. The armature is built without a core, without cotton insulation, without copper, and without a special commutator construction. It is built up of a lattice-work of iron rods, which are separated by air-spaces, and the rods are prolonged as segments of the commutator. The dynamo is multipolar. The smallest of them gives 50 16-candle-power lamps, at a speed of 240 revolutions: the largest supplies 3,500 lamps at 70 revolutions. They are said to be very efficient, which fact, together with their extreme simplicity, will probably cause their extended adoption.

NOTES AND NEWS.

THE Ericsson Coast Defence Company was incorporated at Albany on Friday, March 22, by George H. Robinson, William Williams, Ericsson F. Bushnell, Cornelius S. Bushnell, and Edward S. Innet. The main idea of the company is to manufacture implements for the defence of the American coasts, and to enlist the interest and assistance of the United States Government in the results of the studies and experiments of the late Capt. John Ericsson, who devoted many years and much labor to the subject of our coast defences. The most notable of his inventions in this line is the "Destroyer," a boat built for the destruction of the monitor gunboats. The company claims that the boat has been satisfactorily tested, and believes that it will receive recognition from the present administration. With all the other inventions left by Capt. Ericsson, the Ericsson Coast Defence Company will have nothing to do; that is, with inventions which have nothing to do with the subject of coast defence. There are several of the latter inventions, notably a perfect caloric engine and the sun-motor, which the executors will proceed to patent at once, or at least as soon as they can act in the matter according to law. Owing to the legal advertising made necessary by the conditions of the will, that document cannot be probated before May. Every thing has to be turned into cash, and the necessary delay in communicating with the legatees in Sweden and other parts of Europe will prevent for the present the patenting proposed by the executors. This delay, however, does not affect the operations of the Ericsson Coast Defence Company, which is wholly independent of the will and the legatees.

— The collection of American precious stones, both in the form of crystals and cut stones, which are to be exhibited at the Paris Exposition, Messrs. Tiffany & Co. have decided to place on exhibition on Friday, Saturday, Monday, and Tuesday, March 29 and 30 and April 1 and 2. This collection is one of the finest that has

ever been gotten together, and will be in charge of Mr. George F. Kunz, who has devoted considerable time to its preparation.

— In *Nature* of March 7, J. Starkie Gardner writes as follows on the origin of coral islands: "Mr. Murray's concise explanation of the formation of coral reefs and islands presents advantages in more than one respect. It demands no *a priori* assumptions, but begins and ends with that which can be observed, while Darwin's theory requires the preliminary concession of subsidence, which never has been and never perhaps can be observed. It must appear ungracious to question a theory that accords so completely with the natural history of coral islands; but even this theory requires a geological concession, and that is stability. Coral islands, it may be supposed, after all, only differ from other oceanic islands in being crusted over with coral, so that we cannot see their original state; and the question is, whether we can grant such long periods of stability to them, from our experience of other oceanic islands, which are free from coral, and can therefore be observed. Nearly all oceanic islands are volcanic, and it is probable that their elevation coincides more or less with the period of volcanic activity somewhere along their line. It is obvious that coral islands are not formed during this phase, because no theory would then hold good; the peaks would grow through and carry up the coral, which might leave only such small traces of its existence as we find in a single spot in Madeira. It would not be unreasonable to suppose, that, if the expansive and elevating force were withdrawn, the peaks would slowly subside; and that, if there are some lines of elevation, there must be others of subsidence, unless the earth is as a whole growing in bulk. Darwin claims the existence of areas of subsidence, and that these are eminently favorable to coral-growth; and it is quite apparent that if the Island of Madeira were to sink, as it has undoubtedly risen, its last appearance in a coral sea would be as an atoll. We shall never see the interior structure of a stationary or subsiding coral island, and can only look for a re-elevated example with a crust that has been protected from solution whilst dead and submerged, and yet not sufficiently so to mask the core. In submitting geological considerations, I am not questioning any of Mr. Murray's observations, which are in every way admirable, though it does appear to me doubtful whether atolls could increase outwards in deep water on their own talus, in face of the dissolution of dead coral that is claimed to take place in the interior of the lagoons, and yet more so in deeper water."

— We note with pleasure the advancement to the grade of commander in the navy of Commander R. B. Bradford, who for the past few years has had complete control of the various electric-light instalments in our men-of-war and at the different naval stations. The unvarying success that these numerous plants have met with are well-deserved tributes to the abilities of the naval inspector of electric-lighting.

— Marcus M. Hartog, in *Nature*, writing of the inheritance of acquired characters, says, "A very strong *a priori* objection to the line on which most experiments on the inheritance of acquired characters are carried on is the following. These experiments involve mutilation; and a tendency to transmit characters so produced would, considering that every accident or fight produces some slight mutilation, involve the animals in a process of degeneration: hence the tendency to transmit the characters acquired by mutilation would be constantly bred out by natural selection. But a tendency to transmit characters acquired by habit in youth rests on quite another basis, and would tend to the conservation of the race. I do not know if observations have been made on the physique of the offspring of persons engaged in trades where apprenticeship begins before puberty: they would be most valuable. But the following case seems to me to be thoroughly to the point. A. B. is moderately myopic and very astigmatic in the left eye; extremely myopic in the right. As the left eye gave such bad images for near objects, he was compelled in childhood to mask it, and acquired the habit of leaning his head on his left arm for writing, so as to blind that eye; or of resting the left temple and eye on the hand, with the elbow on the table. At the age of fifteen the eyes were equalized by the use of suitable spectacles, and he soon lost the habit completely

and permanently. He is now the father of two children — a boy and a girl — whose vision (tested repeatedly and fully) is emmetropic in both eyes, so that they have not inherited the congenital optical defect of their father. All the same, they both have inherited his early acquired habit, and need constant watchfulness to prevent their hiding the left eye, when writing, by resting the head on the left fore-arm or hand. Imitation is here quite out of the question. Considering that every habit involves changes in the proportional development of the muscular and osseous systems, and hence probably of the nervous system also, the importance of inherited habits, natural or acquired, cannot be overlooked in the general theory of inheritance. I am fully aware that I shall be accused of flat Lamarckism; but a nickname is not an argument."

— At a meeting of the Physiological Society, Berlin, Feb. 1, Professor Moebius spoke on the movements of the flying-fish through the air. He first described, from personal observation, the way in which the fish shoot out of the water from both bows of the ship, and then propel themselves horizontally for a distance of several ship's-lengths with their pectoral and abdominal fins stretched out flat, skimming along without moving their fins, always in the direction of the wind, but either with or against the same. When they meet the crest of a wave, they raise themselves slightly in the air, falling again to the same extent in the succeeding trough of the sea. Occasionally a slight buzzing of the fins may be observed, similar to that of the movements of the wings in many insects. At night they frequently fall on the deck of the ship. As the result of a detailed investigation, the speaker had proved that these fish do not fly, since the anatomical arrangements of their fins and muscles are not adapted to this purpose. What really occurs is, that, when frightened by the approach of a ship or any enemy, they shoot out of the water, as do so many other fish, and are then carried along by the wind, which strikes on the under surface of their outstretched and evenly balanced fins. Notwithstanding the general acceptance which was accorded to the above investigation, it was urged by many that the buzzing of the fins, the rising over the crest of a wave, and the falling overboard after having landed on the deck of a ship, were evidences that this fish really executes movements which result in flight. In reply to this, Professor Moebius pointed out that the buzzing of the fins takes place when a strong current of air is directed against the outspread fins of a dead flying-fish by means of a bellows, and, further, that the rising over the crest of a wave or the bulwarks of a ship may be explained by the ascending currents of air which are always produced whenever a strong horizontal wind strikes against any elevated object such as a wave or part of a ship. Thus, finally, with the exception of the movements involved in its oblique sudden exit from the sea, all the motions of a flying-fish when in the air are really passive.

— It was claimed awhile ago for an elevator in the Wilder Building, Rochester, N.Y., that it had broken the record, and was the fastest in the country, having made the run from bottom to top, 126 feet, in $6\frac{1}{2}$ seconds, or at the rate of 1,163 feet per minute. The best previous record was said to have been that of an elevator in the Tribune Building, New York City, 110 feet in 8 seconds, or 825 feet per minute. Mere speed alone, however, does not afford sufficient data for a fair comparison, and gives little evidence of how fast an elevator can travel in actual use. The load is a most important item, and should always be stated, as in the following instances cited by *The Engineering and Building Record*, which will be found of interest in this connection. All are in New York City unless otherwise stated. The elevators in the Potter Building have travelled at the rate of 500 feet per minute with a load of 1,000 pounds in the car; those in Aldrich Court will travel about 600 feet per minute with the same load; and those in the Standard Oil Company's Building have made trips at an average speed of 720 feet per minute with 500 pounds in the car, and including the time of starting and stopping. The rise is 133 feet, and the time 11 seconds. What these elevators can do with an empty car, or with a light operator and no passenger, have never been determined. The fastest elevator probably now in existence is the "Water Balance" in the Western Union Building. This machine can attain a speed of certainly 1,000 feet, and probably 1,200 feet, per minute. Similar ones in Chicago, not now in use, are reported

to have reached 1,500 feet. This style of elevator is no longer made, not being as safe as the more modern types. The elevators which combine the greatest power and speed in New York City are probably those in the Produce Exchange, and their counterparts in the Cotton Exchange. These were contracted to lift 2,500 pounds in the car at a rate of 300 feet per minute, and did considerably better at the official trial.

— A substitute for granite blocks for paving purposes is a steel paving block claimed to have superior durability, and whose cost is said to be somewhat less than the stone. It is thus described in *The Engineering & Building Record*: The block is made of steel strips, some two inches and a half wide by one thick, with a rolled channel on the side exposed to traffic, and containing notches about half a foot apart. The weight of these strips is eleven pounds to the yard. They are laid across the street, a distance about five inches between centres; and, as their length is sufficient only to extend to the middle of the street, the proper slope from the centre to the gutters is easily secured. To insure their not slipping sidewise, they are bolted together, and fastened to wooden sills. The support for the new pavement is composed of a firmly constructed bed of gravel, while between the steel strips a compound of pitch and cement is poured, filling the interstices to a level with the tops of the strips, and rendering the surface comparatively smooth.

— *The American Field* is authority for the statement that wild boars have become very numerous in the deep recesses of the Shawangunk Mountains, that border Orange and Sullivan Counties, N.Y. They are the genuine Black Forest wild boars of Europe, the descendants of nine formidable and ferocious boars and sows imported by Mr. Otto Plock of New York, some few years ago, for the purpose of annihilating the snakes and vermin which infested his estate near the Shawangunk Mountains. After the boars had eaten up all the rattlers and vermin in the enclosure, they longed for more, and dug under the wire fencing and escaped to the mountains, where they have since bred and multiplied, and are so ferocious that the most daring hunter hesitates ere he "goes in for game." They have immense heads, huge tusks and shoulders, and lank hind-parts. They attack with a savage rush; and woe betide the hapless hunter who stumbles before one. Wild-boar hunting is greatly indulged in in Europe, and the accidental escape of these nine boars may furnish American Nimrods with sport on "big game" for many years, in the East. Buffalo hunting is not as dangerous as wild-boar hunting, and, as the element of danger is the spice of hunting to many, the Shawangunk Mountains will undoubtedly supply the East with sport the equal of any in the West.

— The shad fishermen of the Atlantic coast are all happy, and very busy preparing their nets and traps for the expected arrival of the vast schools of shad now steering for the coast from different parts of the Atlantic Ocean, this being the season of the year when they seek fresh water. This passion is well known by all shad fishermen; and, according to *The American Field*, thousands of feet of drift nets are being got in readiness on Staten Island, Long Island, along the Delaware, and all along the coast where rivers empty into the ocean. The New York fishermen lay for the shad as they attempt to pass through the Narrows, and are rewarded with tons of the delicious sea-food. The tides are such, however, that they can only work two hours out of six; and this in daytime only, for at night the boats of the fishermen are in constant danger of being run into by tugs and other steam-craft.

— At the meeting of the mineralogical section of the Brooklyn Institute, March 20, Mr. H. Hensoldt, in referring to his experiences as a naturalist in Ceylon, mentioned the fact that he had observed one of the stones carried in the mouth of the cobra-de-capello. This stone is phosphorescent, and the cobra has even been observed with its mouth open, the phosphorescent stone within it, for the purpose, it is believed, of alluring the mate of the firefly *Lampyrus noctiluca*. This substance, Mr. George F. Kunz suggested, was evidently chlorophane, a variety of fluorite which emits a green phosphorescence on being heated. He stated that he had observed that the fluorite found at Amelia Court-house,

Va., would be caused to fluoresce by the heat of the hand, and that a similar variety had been described as occurring from Penandrea, Cornwall, England. He had cut a small stone of this substance, and had passed it around the rooms of the Academy of Sciences, the stone emitting a phosphorescence during the entire time. Mr. Kunz exhibited a copy of Sir Francis Reed's "Experimentala Naturæ" (Amsterdam, 1685), which contained a plate showing eight of these so-called cobra-de-capello stones, to which were attributed the power of curing the bites of serpents and other venomous bites. Mr. Kunz also exhibited specimens of tabasheer, the variety of opal found in the joints of the bamboo, which strikingly resembled in its appearance, and also in its power of absorbing an equal weight of water, the variety of hydrophane described by him from a Colorado cavity, stating at the same time that the *oculus mundi* of the gem-writers of the sixteenth to the eighteenth century was evidently this tabasheer, which is powdered by the natives, and used as a medicine.

— C. O. Boutelle, H. L. Whiting, and B. A. Colonna, a committee of the assistants of the United States Coast and Geodetic Survey, announce, on behalf of themselves and their associates, that they intend to ask the President of the United States to appoint Dr. Benjamin Apthorp Gould of Cambridge, Mass., as superintendent of the Coast and Geodetic Survey. Dr. Gould is no stranger to the Coast Survey. From 1851 to 1868 he was attached to the work, and for nearly fourteen years was in general charge of all its telegraphic longitude parties. Between 1853 and 1867 eleven printed reports bear his name. The first telegraphic determination of the difference of longitude between Greenwich, England, and Cambridge, in New England, was under his general charge, and he personally superintended the observations at the eastern end of the cable, near Foilholerum, in Ireland. Soon after this last great work of 1866-67, he left the country to found an astronomical observatory, and educate native astronomers at Cordova, in the Argentine Republic. What he has done for astronomy in the southern hemisphere during the thirteen years of his stay there, has been well set forth in the "Proceedings of the National Academy of Sciences," at its session in April, 1888, in Washington, when the Watson gold medal was awarded to him for his distinguished and successful labors.

— At the Academy of Sciences, Paris, March 4, remarks accompanying the presentation of a work entitled "Introduction à l'étude de la Chimie des anciens et du moyen âge," were made by M. Berthelot. This work forms a sequel to the author's "Origines de l'Alchimie" and "Collection des anciens Alchimistes grecs," thus completing a series of historical researches which fully establish the true character of the old philosophic doctrines, methods, and practices, which were hitherto supposed to be mainly absurd and fanciful, but which must henceforth enter into the scheme of historical evolution of the positive sciences. Here M. Berthelot gives a full description and translation of the Leyden papyrus of Egyptian origin, the oldest extant treatise on chemistry. The signs, notations, and appliances of the ancient alchemists are also described and reproduced by the photogravure process.

— Capt. Moore, of H.M.S. "Rambler," has lately described in a paper read before the China Branch of the Royal Asiatic Society, and summarized in *Nature*, the appearance and effects of the remarkable "bore" which often occurs in Hangchow Bay. This dangerous visitor is the result of the struggle between the advancing tide in the great estuary and the current of the river. Capt. Moore and his officers on several occasions observed the progress of the wave, and their investigations may be summarized as follows: The rate at which the bore travels varies from ten to about thirteen miles per hour. The height of the bore rarely exceeds 12 or 14 feet; and broken water, in which no small boat could live, follows it for some distance. With the passing of the wave the tide rises many feet in a few seconds; in one instance, observed by Capt. Moore, it rose from 9 feet 4 inches below, to 4 feet 7 inches above, mean level. The rush of the bore was so strong that the force of the waves breaking against the broadside of the "Rambler" sent the water into the mizzen chains, and the spray on to

the poop. The junks in that region are protected by platforms with narrow steps cut in the sides. To the north of the estuary is a great sea-wall, built to protect the surrounding country from being flooded by these great tidal waves. It is thirty-five miles long, and it is strengthened, where the bore strikes most strongly, by an elliptical stone buttress, 253 feet long by 63 feet wide. Behind this the junks are drawn up for shelter.

— A test-piece of Mullens silicated iron, has stood a compression of 120,000 pounds per square inch. It finally broke in the same manner as specimens of stone do. It contained a very large proportion of silica.

— The latest news from the Sudan encourages the hope that Emin Pacha has successfully resisted the Mahdi, and makes it probable that Osman Digma's report of his surrender was solely a trick to prevent the English from action at Suakim. A despatch dated from Cairo, March 23, says that Mahommed Beraivi, who has arrived here from Omdurman, reports that Sheik Senoussi's forces occupied Darfur and Kordofan, and expelled the dervishes. In July last, Mahommed Beraivi accompanied an expedition of six thousand Mahdists which proceeded in steamers and barges against Emin Pacha. He states that Emin defeated the dervishes near Bor, killing most of them, and capturing their steamers and much ammunition. A despatch of the following day adds that Emin was reported to be in good health, and that all his people and some European travellers were with him in Bahr-el-Gazal.

BOOK-REVIEWS.

Profit Sharing between Employer and Employee. By NICHOLAS P. GILMAN. Boston and New York, Houghton, Mifflin, & Co. 12°. \$1.75.

THIS is an elaborate history of profit-sharing, beginning with the initiation of the system in France by Leclair, and tracing its development in Europe and America to the present time. The author shows a deep interest in his subject, and gives evidence of painstaking industry in the study of the facts. His work is well written and well arranged, and presents as exhaustive an account of the subject as any reader will be likely to want. Though Mr. Gilman is a firm and even enthusiastic believer in profit-sharing as a cure for the industrial evils of the age, he does not fail to recount those experiments with the system that have failed, as well as those that have succeeded. He does not confine himself however, to the mere history of the system, but discusses its value and its relations to the present wages system on the one hand, and to that of co-operation on the other. Co-operation, he thinks, is not destined to succeed, except under specially favorable circumstances, because the laborers are not willing to pay a sufficient salary to their manager to secure the best talent. Profit-sharing, on the other hand, leaves the management where it is now, while it furnishes the means, as Mr. Gilman thinks, to reconcile the laborers to their position. How far these views are correct, time alone can tell; but we would point out that the *Maison Leclair*, which the author chiefly relies on as an example of profit-sharing and its benefits, is really a co-operative society, somewhat different from the ordinary type, but none the less really co-operative. The workmen, or a certain portion of them, own one-half the capital, the two managing partners owning the remainder; and when one of the managing partners dies, or retires from the firm, the workmen who are shareholders choose his successor. Part of the profits are divided among all the workmen, whether they own capital or not; but this is only one of the distinguishing features of the *Maison*, that of co-operation being quite as prominent. We shall be glad to hear that Mr. Gilman's work meets with a ready sale.

Deductive Logic. By ST. GEORGE STOCK. London and New York, Longmans, Green, & Co. 16°. \$1.25.

THIS is an ordinary treatise on formal logic, with no considerable deviations from the usual type. The author says that before publishing the work he submitted it to the criticism of a friend, who advised him to strike out some new matter which the manuscript contained, and that he did so, retaining only a few novelties. Those

that are retained do not seem to us of any particular value, while one of them is of doubtful expediency: we mean his use of the term "privative attribute." This term has always been used to mean the absence of an attribute where it was once present or might be expected to be present; but Mr. Stock uses it to mean the absence of an attribute in a thing that might have it, as when a dish is called "empty." The execution of the work is in the main good; the style of expression, in particular, being very clear. The least satisfactory part in this respect is that relating to the syllogism, which, as in most other logical works, contains too much technical matter, and does not present a sufficient number of concrete examples to illustrate the principles. But while Mr. Stock's mastery of the forms of reasoning is complete, he has some views as to its nature and validity which can hardly pass unchallenged. Thus, he says that "inductive inferences are either wholly instinctive, and so unsusceptible of logical vindication, or else they may be exhibited under the form of deductive inferences (p. 128). And again he affirms that "no inductive inference can ever attain more than a high degree of probability; whereas a deductive inference is certain, but its certainty is purely hypothetical (p. 130). If this is true, the human intellect is in a bad way. Hence, without meaning to detract from the merits of Mr. Stock's work, we would suggest that what the world needs at the present time is not a new presentation of the forms of reasoning, but a deeper study of the nature of reasoning and of the principles on which it depends.

Botany for Academies and Colleges. By ANNIE CHAMBERS-KETCHUM, A.M. Philadelphia, Lippincott. 12°. \$1.

THE course of study in these lessons is based upon the inductive method of A. L. de Jussieu. Beginning with cryptogamia, plant-development is gradually unfolded, from the green stain on the door-stone to magnolia and clematis. Although the natural system is followed by the author, there are some departures from the method of Jussieu, its founder. This is recognized by the author, who, however, expresses the opinion that if Jussieu had lived to learn the lessons of the fossils, as well as other late discoveries in science, he would have been the first to advocate an arrangement which is so logical because it is so natural.

In addition to structural botany, which includes morphology, physiology, phytotomy or plant anatomy, and chemistry, systematic botany is concisely dealt with. The rules for nomenclature and pronunciation are especially deserving of mention. A manual of plants, including all the known orders with their representative genera, forms the second part of the volume. It is, of course, merely an outline of the 150,000 or more known species of plants, but it appears to be very complete. An excellent index and well-executed illustrations render this book one of the best for teaching purposes which we have seen.

A History of Eighteenth Century Literature. By EDMUND GOSSE. London and New York, Macmillan. 12°. \$1.75.

THIS is the third volume of the history of English literature which the publishers are now issuing, the second volume of which was noticed in *Science* when it appeared. The different volumes are by different writers, each chosen for his special acquaintance with the period to be dealt with, and the first and fourth volumes are not yet published. The present work covers the period from 1660 to 1780, — a period, as the author remarks, not exactly contemporaneous with the eighteenth century, but nevertheless forming a distinct chronological division in the history of English literature. The work is in the main well done, though it cannot be said to have any special charm of style. Its principal defect, according to our thinking, is the disproportionate attention it gives to insignificant writers, many pages being devoted to an account of works that are never read now except by a very small number of literary specialists. Mr. Gosse justly remarks that the principal work of the period under review was "to reform and regulate ordinary writing." The prose of the preceding age had been involved and clumsy to an extraordinary degree, and it was during the latter part of the seventeenth century that Englishmen first began to write in a style similar to that of the present day; while some of the writers of the eighteenth century have hardly been surpassed since. Another

notable work of the eighteenth century itself was the creation of the novel; and Mr. Gosse gives careful attention to both these literary developments. The principal figures in the literature of the period are, in Mr. Gosse's opinion, Dryden, Swift, and Johnson, though it would seem that Richardson, as the inventor of the novel, was entitled to equal rank. The greatest master of prose style, Mr. Gosse thinks, was the metaphysician Berkeley. It must be understood, however, that the book does not deal with philosophical and scientific writers except with reference to their style. In his last chapter the author considers the relation of the English literature of the period to that of the Continent, — a subject that we should have been glad to see more largely treated.

Insects Injurious to Fruits. By WILLIAM SAUNDERS, F.R.S.C. 2d ed. Philadelphia, Lippincott. 12°. \$2.

THE first edition of this book appeared in 1883. The experience of Mr. Saunders as director of the Experimental Farms of the Dominion of Canada, and as editor of the *Canadian Entomologist*, would lead us to expect a valuable contribution from his pen. In this expectation we are not disappointed. The matter of the original edition was as complete as it could well be made. Since it appeared, additional facts have come to light, and in the second edition we have these facts embodied. For those who are not familiar with this admirable treatise, we will give a brief outline of its plan and contents.

The cultivation of fruit in America has now become such a matter of importance that every one, whether grower or consumer, is interested in the discovery of every thing which hinders or promotes this great industry. One of the most important factors is insect-life. Injurious insects are so universally distributed that there is no part of this continent where fruit-culture can be profitably carried on without some effort being made to subdue them. But all insects are not injurious. There are friendly species as well as those that are inimical. Indeed, it is to these friendly ones that nature has assigned the task of keeping in subjection those that are destructive, by devouring either their bodies or their eggs. Thus it becomes a matter of great importance that the fruit-grower should be able to distinguish between friend and foe, lest, in his efforts to destroy the latter, he may be depriving himself of his strongest ally. Until Mr. Saunders took this subject in hand, the fruit-grower was obliged to search for much of his information in State and departmental reports, or in books on scientific entomology. In these volumes the practical knowledge is so much encumbered with scientific and other details as to make the acquisition of it too laborious a process for those whose time is so fully occupied as is that of the practical fruit-grower. In the book before us the author has endeavored to bring together all the important facts relating to insects known to be injurious to fruits in all parts of Canada and the United States. His experience as a fruit-grower and student of entomology for nearly thirty years has enabled him to succeed in his self-appointed task, and to present the results in a concise manner, and as free from scientific phraseology as is possible. In the arrangement of the subject, the author has adopted the plan of grouping together the insects injurious to a particular tree or plant. Thus, under the heading, "Insects Injurious to the Apple," we find all the known species inimical to this fruit-tree. These main headings are still further subdivided into those which treat of the insects which attack the roots of the apple-tree, those which attack the trunk, the branches, the leaves, and the fruit. Each of these is fully illustrated, so that the determination of any injurious species is rendered comparatively easy. The species having been identified, the methods to be adopted for its destruction are described. The plan is not only an admirable one from a theoretical point of view, but that it is also a practical one, and one which meets the wants of those interested, is demonstrated by the demand for a second edition. Not less worthy of commendation is the execution of the work. An author's best efforts are often rendered nugatory by the parsimony of his publisher, who is unwilling to provide the necessary illustrations or such paper and type as will make the book attractive. In this respect there can no fault be found by Mr. Saunders. The execution of the work is excellent in all respects, making its perusal a pleasant as well as a profitable task.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.....\$3.50 a year.
Great Britain and Europe.....4.50 a year.
Science Club—rates for the United States and Canada (in one remittance):

1	subscription 1 year.....	\$ 3.50
2	" " 1 year.....	6.00
3	" " 1 year.....	8.00
4	" " 1 year.....	10.00

Communications will be welcomed from any quarter. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

VOL. XIII.

NEW YORK, MARCH 29, 1889.

No. 321.

CONTENTS:

THE SUBMERGING MONITOR CRUISER.....	229	BOOK-REVIEWS.	
TOBIN BRONZE.....	230	Profit Sharing between Employer and Employee.....	238
A LARGE ELECTRIC-CURRENT CONDUCTOR.....	230	Deductive Logic.....	238
A METEOROLOGICAL EXHIBITION.....	230	Botany for Academies and Colleges.....	239
THE HORNIG DIRECT-POWER STEERING SYSTEM.....	231	A History of Eighteenth Century Literature.....	239
PLATINUM.....	232	Insects Injurious to Fruits.....	239
THE HISTORY OF PORPHYRITIC QUARTZ IN ERUPTIVE ROCKS.....	232	EDITORIAL.....	240
ETHNOLOGY.		The Treatment of Insane Criminals in New York.—New Projects for Polar Explorations.....	
The Man of Spy.....	232	THE WOMEN'S ANTHROPOLOGICAL SOCIETY OF AMERICA	
Beans cultivated in Prehistoric Arizona.....	233	Mrs. Anita Newcomb McGee.....	240
ELECTRICAL NEWS.		THE "EXCELSIOR CLASSES" IN AUSTRALIA.....	242
Electrical Lines of Force.....	234	AMONG THE PUBLISHERS.....	243
Arc-Lamp for Incandescent Circuits.....	235	LETTERS TO THE EDITOR.	
Dynamo-Designing.....	235	The Soaring of Birds.....	
The Magnetic Action of Displacement Currents in a Dielectric.....	235	Wm. H. Pickering.....	245
Patents on Alternating-Current Transformers.....	235	Definition of Manual Training.....	
The Tesla Alternating-Current Electric Motor.....	235	J. E. Clark.....	246
The Birmingham Electric Locomotive.....	235	Curves of Literary Style.....	
The Dimensions of Electrical Units.....	236	H. A. Parker.....	246
A New Dynamo.....	236	The Velocity of Storms as related to the Velocity of the General Atmospheric Movements.....	
NOTES AND NEWS.....	236	H. Helm Clayton.....	246
		The Robinson Anemometer Factor.....	
		C. F. Marvin.....	248

THE PRACTICE which has existed in the State of New York since 1864 of confining insane persons charged with crime at the Auburn State Asylum for Insane Criminals has seemed to many to be in need of revision. Senator Pierce has introduced into the Legislature a bill to discontinue the practice. In addition to this measure, others affecting the lunacy laws are before the Legislature for its consideration. One of these provides for the appointment of six commissioners to revise all the laws of the State relating to lunacy; another, if passed, will substitute a commission for the one existing commissioner; still another measure provides for the care of the dependent insane in State rather than, as is now the practice, in county institutions. This latter bill seems to us to be by far the most important of all those which have been introduced during the present year. Under this law the State will be divided into districts by a board, to be constituted of the president of the State Board of Charities, the State commissioner in lunacy, and the State comptroller. After this board shall have established the insane districts, they are to file with the secretary of state the boundaries of the same, and the number of pauper insane people within each. In each of these districts suitable buildings and accommodations are required to be erected, either on new sites or on the site of some asylum already in existence. To these asylums, indigent and pauper insane are required to be sent for maintenance, instead of

being retained in county asylums. There are sixty counties in the State, and as many insane-asylums. Under the proposed law, this number would be reduced to ten. It would be possible to establish a uniform system of treatment in institutions managed by a State board, which it would be next to impossible to effect under the county system. The proposed plan would put a stop to the abuses which are believed to exist in some of the present institutions, and is, for this and many other reasons, supported by the medical profession and laymen who are familiar with the disadvantages of the present system.

RECENTLY SOME NEW PROJECTS of polar explorations have been made. Since the failure of the British Government to support the scheme of the Australian colonies, little has been done regarding the proposed Antarctic expedition. At present, according to the *Journal of the Royal Geographical Society*, a scheme is on foot for the furtherance of Antarctic exploration by private enterprise. A New Zealand colonist (a Norwegian) has gone to Europe for the purpose of taking out with him a number of Norwegians who have been accustomed to fishing. In one or two steamers, the gentleman referred to intends to send out these Norwegians, under proper command, accompanied by one or more scientific men, with suitable equipment, for the purpose of exploring the Antarctic region, with the ultimate object of establishing a whale-fishery on an extensive scale. If at all practicable, a party will be left during a whole year on Victoria Land, or other suitable place, in order that the conditions of the region may be thoroughly investigated.

On the other hand, various plans of continuing Arctic researches are on foot. It is stated that a movement has been started in Norway for the despatch, in the summer of 1890, of an expedition which will try to reach the north pole; and it is proposed to offer the leadership to Dr. Nansen, who will probably return from Greenland in a few weeks. The intention is that an attempt should be made to reach the pole by way of Franz-Josef Land, — a route which is advocated by some of the most competent authorities on Arctic explorations. *Ski*, which have played so prominent a part in the Nordenskiöld and Nansen Greenland expeditions, would no doubt again prove of service. The Geographical Society of Bremen is about to send out an exploring expedition to the Spitzbergen Sea, the main object being inquiries into the zoölogy of this region. The scientists of this expedition will be Dr. W. Kükenthal, the well-known zoölogist, and Dr. A. Walter. The party will start from northern Norway.

THE WOMEN'S ANTHROPOLOGICAL SOCIETY OF AMERICA.¹

ON June 8, 1885, ten intellectual women of Washington met to form a scientific society. The idea was a novel one and hazardous, in that only one of the participants had ever done scientific work; to wit, Mrs. Tilly E. Stevenson. In her mind the plan of a woman's anthropological society was conceived; and to her energy, ability, and fostering care are due its birth and larger growth.

At the time of organization the objects of the society were stated to be, "first, to open to women new fields for systematic investigation; second, to invite their co-operation in the development of the science of anthropology." The present constitution declares that "the object of this society shall be to promote anthropology by encouraging its study and facilitating the interchange of thought among those interested in anthropologic research, and by arranging and preserving systematically all information relating to it, and also by holding regular meetings for its discussion."

It is often asked why there should be two anthropological societies in Washington. Speaking for ourselves, we have no desire to

¹ General report of the recording secretary, Mrs. Anita Newcomb McGee, read before the society at Washington, D.C., Feb. 25, 1889.

perpetuate a distinction of sex in science; and were we all professional scientists, or possessed of education fitting us to enter the race for intellectual attainment without handicap, we doubt whether a second society would ever have been formed. Under existing conditions, however, we are satisfied to work out our own problems in anticipation of the time when science shall regard only the work, not the worker.

The society has managed its business, held its regular meetings, and listened to the papers of its members, for nearly four years, and, in spite of prophecies to the contrary, has slowly but steadily grown, — all without a single unfriendly disagreement or any pre-sage of dissolution.

Much of the credit for this success and harmony is due to Mrs. Stevenson, the founder, and for three years and a half the president, of the society. Her principal supporter at first was Miss Sarah A. Scull, then teacher of ancient history and mythology in Mrs. Somers's school for girls, and the society's corresponding secretary. The other officers selected at the preliminary June meeting were Mrs. Emma Louise Hitchcock for recording secretary, and Mrs. Mary Parke Foster for treasurer. A constitution was draughted and adopted at the same meeting, and the society then adjourned until Nov. 28, 1885. By-laws were proposed on Dec. 12 of the same year. At the first annual meeting, held Jan. 30, 1886, the constitution and by-laws were amended, and additions were made to the board of trustees in accordance with the code. These were the two vice-presidents, Mrs. Mary E. James and Mrs. Lida Nordhoff, and six trustees, — Miss Alice C. Fletcher, Mrs. Jean M. Lander, Mrs. Emma Hammond Ward, Mrs. Mary Olmsted Clarke, Dr. Clara Bliss Hinds, and Mrs. Cornelia E. McDonald.

Other names which appear later on the board are Mrs. Sybil Augusta Carter and Mrs. Eliza Blair, as vice-presidents; Mrs. Blair, having previously filled the office of corresponding secretary, succeeding Miss Scull when the latter departed this country for Greece, in May, 1886. At the same time the recording secretary, Mrs. Hitchcock, temporarily left the young society, and journeyed toward Japan, where she observed the ever-interesting Orient for our future benefit. An able and worthy successor to the secretaryship was found, however, in the person of Mrs. Mary Olmsted Clarke. Mrs. Melissa A. Bryan, Mrs. Miranda Tullock, and Miss Florence P. Spofford have more recently served as trustees of the society. At the close of 1886 it was found necessary to subject the original and temporary constitution and by-laws to a thorough revision, and this task was accomplished so well that no alterations have since been made.

The members of the Women's Anthropological Society of America are grouped in three classes, — honorary, corresponding, and active. The last includes a sub-class of absent members, who are temporarily inactive. As originally organized, the society contained one honorary member, — Miss Rose Elizabeth Cleveland, — and twenty-one active members, of whom five were not residents of Washington. The policy of the society has always been to maintain a high standard of membership, one result of which is a practical limitation in numbers. The formalities surrounding the admission of new members are such that about a month elapses before a proposed name can be finally enrolled. At the same time, any thinking, intelligent woman likely to take practical interest in the work is gladly welcomed to the society.

The membership to-day includes three honorary, eleven corresponding, and forty-six active members. Seven among the last are upon the absent roll.

Regular meetings are held on Saturday afternoons of each alternate week from November until May inclusive. The fiftieth of these will be held on Saturday of this week. The average attendance has varied in different years from eleven to fifteen. For over two years the society has been greatly indebted to the president and trustees of Columbian university for the use of the reception-rooms of the university building for our bi-weekly meetings. The regular meetings are devoted primarily to the presentation and discussion of original scientific communications; and all business, except elections, is transacted in detail at meetings of the board or in committee before being submitted to the general society.

In addition to the regular meetings, the by-laws provide for spe-

cial meetings, and an annual meeting in January for the election of officers and trustees and the reading of reports. An annual reception may also be given, at which the retiring president is expected to deliver an address. In 1887 this reception was omitted, owing to the illness of the president. This is the only occasion on which refreshments are permitted by the code.

The year 1889 has seen many changes in the board of trustees. As constituted at present, it is as follows: president, Mrs. Sybil Augusta Carter; vice-presidents, Mrs. Mary Parke Foster and Miss Alice C. Fletcher; recording secretary, Mrs. Anita Newcomb McGee; corresponding secretary, Mrs. Emma Hammond Ward; treasurer, Miss Florence P. Spofford; members at large, Mrs. Mary Olmsted Clarke, Mrs. Jean M. Lander, Mrs. Marianna P. Seaman, Miss Lydia M. Dame, and Mrs. Hannah L. Bartlett, with a vacancy to be filled at the next meeting.

One of the first movements of the new board has been toward the formation of a library. A number of important works have been presented to the society, and through the courtesy of Major J. W. Powell these are about to be placed in the library of the Bureau of Ethnology. Donations of anthropologic works will be gratefully received by the librarian, Mrs. Marianna P. Seaman.

Were we dependent upon what the society had published, our library could be easily read. With the caution and forethought characteristic of our founder and her associates, the youthful body has refrained from much printing. Four small pamphlets have, however, appeared. "The Organization and the Constitution of the Women's Anthropological Society" (1885) was superseded in 1887 by the revised "Constitution, By-Laws, and List of Members." The two other pamphlets were designed to direct the members in their work. "Child-Growth," by Dr. Clara Bliss Hinds (1886), was a plea for, and directions concerning, anthropometry. "What is Anthropology?" by Professor Otis T. Mason (1888), was printed by the society as the best available classification of anthropologic science, and at the same time as a guide to the branches of the subject requiring investigation.

It is now hoped that a volume of proceedings may be published at no distant day, though the material for it is considerably diminished by the publication elsewhere of several valuable contributions. As a general rule, a single paper, nominally thirty minutes in length, is read and discussed at each meeting. Forty-three communications have thus far been contributed by members, a number of which were presented orally, and two presidential addresses have been delivered. In addition, two lectures were delivered at special meetings in 1887, — the first on Feb. 12, by Mr. A. R. Wallace, on "The Great Problems of Anthropology;" and the second on April 23, by Mr. J. H. Smyth, on "The African in his Home and in America."

In reviewing the work of the society, it is noticeable that the majority of the papers represent the results of personal observation on the part of their authors. They are real contributions to knowledge, generally much condensed from abundant material collected on some given subject.

It results from this custom that no discussion has ever been given to the origin, antiquity, or primitive condition of man, and no studies have been made in race-classification or in philology.

A large number of papers are ethnographic in character, as were the two presidential addresses of Mrs. Stevenson, — "The Religious Life of the Zuñi Child," delivered in 1886, and published in the "Fifth Annual Report of the Bureau of Ethnology;" and "The Thirteen Medicine Orders of the Zuñi," delivered in 1888, and printed in abstract in *Science*. Four other papers presented by Mrs. Stevenson either have appeared or are to appear among the publications of the Bureau of Ethnology. Their subjects are, 1st, "The Moki Indian Snake-Dance;" 2d, "Mission Indians," in which are described the cosmogony, the ceremony of purification upon arriving at puberty, and the baptismal ceremony of the San Luisano Indians of southern California; 3d, "The Sand-Paintings of the Navajos;" and, 4th, "Zuñi and the Zuñians." Some of these papers were illustrated by original drawings. Of similar character are the four papers from Miss Alice C. Fletcher, an original member of the society, who needs no introduction to the students of anthropology here or abroad. The first of these, "Omaha Child-Life," appeared in part in the *Journal of American Folk-*

Lore. The second, entitled "The Supernatural among the Omaha Tribe of Indians," was afterwards published in Vol. I. No. 3, of the "Proceedings of the American Society of Psychical Research." The third paper was on "Winter Life among the Winnebago Indians;" and the fourth, on "The Heathuska Society of the Omaha and Ponka Indians and Indian Music." The last is now in press as a publication of the Peabody Museum of American Archaeology. Commendation of the original and important work of Mrs. Stevenson and Miss Fletcher would be quite superfluous.

"Legends and Historical Sketches of the Iroquois Indians" (Washington, 1887) is the title of a privately printed pamphlet by Mrs. Laura M. Scofield, containing material previously presented to the society in two papers. Two valuable communications have been given orally by corresponding members: viz., "Reminiscences of Life among the Iroquois Indians in the Province of Quebec," by the late Mrs. Erminnie A. Smith; and "The Sioux Indians," by Miss Mary C. Collins of Dakota.

A number of members at one time found a most interesting field for study in the Basque races, and their results were presented in a series of brief papers. Mrs. Seaman discussed the home life of the Basques; Mrs. Carter and Mrs. Tullock, their literature; Mrs. McDonald described their marriage customs; and Miss Spofford, their music. Miss Cathcart also condensed the results of prolonged study into an account of the spread of the Turanian races into Europe.

These papers on the Basques are all compilations, but personal observation is again represented in such communications as the following: Mrs. Carter, our esteemed president, has given an admirable account of the Hawaiians, while Mrs. Jean M. Lander ably described some customs and manners of Scotch Highlanders. Mrs. Melissa A. Bryan offered some notes upon the Japanese; Mrs. Louise F. Hunt talked about Russia; and Miss Elisa R. Scidmore has quite recently presented a chapter from her forthcoming work on Korea.

The division of technology is represented by several papers, three of them being especially noteworthy and interesting. Under the title "Habitations of Man," Mrs. Hannah L. Bartlett summarized her researches concerning the dwellings of a large number of civilized people. An account of house-building in Alaska came from Mrs. Ella F. Thomas, as one result of a two-years' stay in that land. To these Mrs. Carter added some facts concerning the habitations of the Hawaiians. Mrs. Matilda G. Bancroft of San Francisco acknowledged her membership in our society by sending a paper on "Ceramic Art of the Pacific Coast;" and Mrs. Mary E. Brown of New York, a corresponding member, read what has since appeared as the chapter on "Chinese Music," in her book entitled "Musical Instruments and their Homes" (New York, 1888). Another interesting and important contribution, from Mrs. Scofield, is on "Petroleum and Natural Gas and their Relations to Man."

Only two papers may be classed as archæologic. The departure of Miss Sarah A. Scull for Greece in the spring of 1886 has already been mentioned. Her destination was Athens, where for over two years she was connected with the American School of Classical Studies, and pursued original researches among the ruins of Hellas. Her work and that of her associates was the theme of a most interesting discourse with which the society was lately favored.

An account has been given of studies in a similar direction, though not so detailed in character. The communication of Mrs. Mary Parke Foster on "The Ancient Ruins of Mexico" was based on material collected during a seven-years' residence in our neighboring republic. During this time some expeditions into almost unknown territory were made, and certain ruins explored for the first time by a foreign lady.

In the division of sociology appears a recent account of the evolution of a community. In this Mrs. McGee followed the development of a religious body from its origin in Germany through various stages to its present state as the most successful communistic organization in America. Two years ago the study of folk-lore was commended by Miss Ellen Wier Cathcart, and Mrs. Mary Olmsted Clarke gave some negro song games which had not been discovered by either Mr. W. H. Babcock or Professor H. C. Bolton.

Last, but not least, must be mentioned the papers in somatology, some of which have also touched on psychology. Mrs. Clara Bliss Hinds, M.D., has long made a special study of anthropometry, and has urged upon our members the value of proper measurements and records in her paper already noted on "Child-Growth" and in "How to Study Children." Mrs. Mary E. James presented an able *résumé* of studies made in the asylums of Brooklyn, N.Y., in her communication on "Food in its Relations to Child-Growth." Under the title "Comparative Human Growth," Mrs. Emma Hammond Ward set forth some important but little known physiologic laws and their mental and moral bearing upon the race. Here, too, must be included Mrs. Scofield's paper upon "Life." Finally, the president of the Washington branch in the Association of Collegiate Alumnae, Mrs. Anna Howes Barus, has treated us to "The Physical History of College Women," an article based on statistics collected under the direction of its author, and already published elsewhere.

Such are the principal themes thus far discussed by our society. In these brief notes it has been impossible to convey more than the vaguest idea of their scope or character, or to indicate their value as original contributions to knowledge. The purpose of this report will have been served if some conception has been given to this new work undertaken by women, and of the progress already made upon it. Mistakes have been made in the management and work of the society. We do not claim perfection in any particular, but we do believe our organization to be the minute seed from which a great forest will spring.

There are hundreds of societies in which knowledge is cultivated and fostered for its own sake, and in which many grand and useful conceptions find birth; there are in the United States several scientific societies devoted wholly to anthropology; but among all of these the first to be organized and maintained by women alone is the Women's Anthropological Society of America.

THE "EXCELSIOR CLASSES" IN AUSTRALIA.¹

ABOUT five or six years ago, Mr. William Groom, a young workman in a silk-hat factory in Melbourne, used to observe with great distress the large number of boys who were drinking in the saloons of the city, especially on Saturday nights. The sight at last troubled him so much, that he resolved to attempt some method of diminishing the evil: so one evening he accosted a group of boys in a saloon, and asked them whether they really found any enjoyment in that mode of spending time. They answered that perhaps, after all, there was not much fun in it. Mr. Groom then invited them to come next Saturday evening to his lodgings, and said that he would try to furnish them with better amusement. Some of the boys came; and Mr. Groom, though feeling awkward and embarrassed, did his best to entertain them with games, reading, and a little personal talk. By degrees his unique power of influencing boys became manifest; numbers began to gather round him; and his work became known to few persons of wealth and position, who, recognizing Mr. Groom's peculiar gifts, agreed to guarantee a sufficient sum annually to enable him to devote his whole time to the work among the boys.

It may be mentioned, in passing, that Mr. Groom's most enthusiastic supporter is a young artist, belonging to a family of high standing and influence in Victoria, who is himself carrying on an interesting and valuable work in the Melbourne Hospital. Owing to impaired vision, he is able to work at his profession only during the morning hours: he therefore devotes three afternoons in the week to visiting the patients in the surgical wards of the hospital, — those in the medical wards having comparatively little superfluous energy, — reading and talking to them, keeping them supplied with books, and teaching them netting, macramé-work, and the construction of picture-frames and a variety of other artistic and useful objects. The various materials required he brings at each visit. In this way the wearisome hours of the patients are lightened, some useful minor industries are learned, and the sale of the products gives the patients in many cases a substantial sum of money to make a fresh start when they are discharged from the hospital.

¹ Notes of a talk by William Grey, Esq., of the Denison Club, London, to a few students of social science in the Johns Hopkins University, Jan. 12, 1889.

To return to Mr. Groom's special work. When he was enabled to give his whole time to it, the movement spread rapidly. Six or seven large classes, each consisting of several hundreds of boys, were formed in various parts of the city. Mr. Groom's earnest endeavor throughout was to establish them on a self-governing and self-supporting basis, and to avoid all showy display of the work for the sake of obtaining "patronage" and contributions. The weekly meetings of the classes are held primarily for the sake of mutual entertainment. A large room is either lent or rented, and a varied performance takes place, — songs, recitations, an occasional farce, and a few words of advice, admonition, or encouragement from the leader of the class. The chairman of the meeting is elected by the boys, as also are the secretary, treasurer, and door-keepers. Mr. Groom, when he is present, is always elected as leader. The small dues of the class, usually about six cents, are collected weekly. In connection with the classes, too, are penny banks and lending libraries. A remarkable work has been carried on by some of the bigger boys, who were formerly leaders in mischief and outrage among the vicious "larrikins" who nightly haunt the streets of the Australian cities, and cause sore perplexity to those who study social problems in those colonies. A few of these reclaimed "hoodlums," sally forth together on Saturday nights, go from one saloon to another, and, if they see boys drinking there, bid them come out and join them. The boys instinctively obey their former leaders, meekly follow them, and are brought within the circle of influence of the Excelsior Classes.

From Melbourne the movement has already spread to Sydney. A young clerk in one of the government offices of New South Wales, while on a visit to Melbourne, heard of Mr. Groom's work, and was so deeply impressed by what he saw of it that he determined to devote his evenings to a similar work in his own city. An admirable class is now organized in the midst of a very poor district.

It was at Sydney that I first came into contact with the work. I well remember the striking character of the scene. Passing between two vigilant boy door-keepers, I entered a large, bare school-room, lighted with flaming gas-jets. More than a hundred boys of all sorts and sizes, many ragged and with bare feet, were sitting, absolutely quiet and orderly, with eager, intelligent faces, listening to a few words from their elected leader or "critic," as he is here styled, the government clerk whom I have mentioned. The chairman, secretary, and treasurer, each adorned with a broad crimson scarf, as of some knightly order, were at their posts. Then the entertainment began, consisting almost entirely of recitations and songs chosen by the boys themselves. No trace of any thing coarse or low appeared: the tendency, oddly enough, was to pieces of a profoundly melancholy and sentimental order. The choruses of the more lively songs were taken up by the whole body of boys with an energy which seemed almost great enough to break the windows and blow off the roof. But throughout the meeting the order and discipline maintained for themselves by these rough street boys was simply perfect. After the entertainment was over, the treasurer collected the weekly dues, and then the business of a penny bank was transacted. I left the meeting, feeling that I had seen the finest sight in all Australia.

Some weeks later I had the privilege of meeting Mr. Groom himself at his little house near Melbourne. At this time he was in a very shattered state of health, and only just recovering from the effects of a terrible railroad accident. He had been compelled for six months to withdraw entirely from the supervision of the Excelsior Classes; but he was still able to attend to a deeply interesting branch of his work at home, — the rescue of boys of the most depraved and degraded class, whom he had found lying about the wharves at night, or had intercepted on their discharge from prison.

He showed me in his back garden a low, long barrack of six little chambers, separated from each other by solid walls, so that no communication should be possible by night among the inmates. Each room was simply but prettily furnished. On the wall hung an illuminated and framed copy of the Lord's Prayer; and in another frame, a stanza of some hymn or poem, intended to meet the special need of the occupant of the room. During the day the boys are sent to the public school: the rest of their time is filled up

with work of various kinds, — carpentry, digging, gardening, and household duties. They take their meals with Mr. and Mrs. Groom, and thus learn decent manners at table. Mr. Groom has gone with great care and thoroughness into the subject of the various forms of vice to which these poor boys are specially prone, and uses every effort to ascertain and apply the surest and most appropriate remedies and preventives. When the boys have been thoroughly reclaimed, they are drafted off to places in the country. The demand for the boys is far greater than Mr. Groom can supply.

This is a department of his work which Mr. Groom guards with the greatest care from ostentatious publicity, rightly deeming that the subject is far too grave and awful to be made a matter of advertising and promiscuous patronage. The necessary funds are, I believe, supplied by a few attached friends, and by a single large business firm. It is by no means easy — *experto credite* — for others to obtain the privilege of contributing to the work.

It was exceedingly interesting to observe the effect upon the Excelsior Classes of Mr. Groom's disablement. Four or five of the classes, it must be confessed, had at the time of my visit lapsed into a state of suspended animation, although there was every reason to hope that they would revive at Mr. Groom's touch. One class which I visited was still in operation, but it was evidently on the point of breaking down. The temporary leader, a good and really heroic young fellow, was evidently not quite fitted for his post. On the evening of my visit the meeting was a very large one, and a number of turbulent youths had made their way in. The leader, as I could tell from my former scholastic experience, was at fault in every appeal which he made to the audience, and naturally excited some derision. However, the performance was creditably gone through, in spite of some interruptions. I was struck by the genuine courtesy of the boys, who, although I was the only visitor present in the unruly assembly, never by word or act made my position in the slightest degree uncomfortable, although considerable ingenuity was shown in worrying their "leader." I was not surprised to learn that the subsequent meeting broke up in confusion, and the class was suspended.

In the next class which I visited, all was cheering and hopeful. About a hundred boys, with many of their friends and relations, were present in a cheerful, well-lighted schoolroom. An admirable entertainment was provided, — songs, recitations, a short farce, and, if I remember rightly, some gymnastic exercises. A few wholesome words were addressed to the boys by their elected leader, — a young, fresh-looking boy, who is employed as a clerk in a business-house. Although the class had for six months been deprived of Mr. Groom's supervision, the order and discipline of the meeting left nothing to be desired. The genial *bonhomie* and courtesy of the boys deeply impressed me. I remained for some time after the meeting, talking with the boys, and examining their library and savings bank. My favorable impression was continually deepened. Here, I thought, was a sight even grander than I had witnessed in Sydney, as proving what democratic government, free from all suspicion of being qualified, may do among boys.

Some further details of this interesting work may be derived from *The Excelsior*, — a monthly paper which was, and not improbably is still, published for the classes. Mr. Groom himself is always pleased to communicate with persons who are genuinely and practically interested in this and similar work. Address W. Groom, care of Edw. à Beckett, Brighton, Melbourne, Australia.

AMONG THE PUBLISHERS.

GINN & Co. have in preparation "Our World," by Mary L. Hall, revised and arranged as a supplementary reading-book.

— The latest issue of Ticknor's Paper Series is the novel "Under Green Apple Boughs," by Helen Campbell. The story is illuminated by eight full-page pictures by Howard Pyle.

— The *Fortnightly Review* for March (New York, Leonard Scott Publication Company) opens with the first of Sir Charles Dilke's important and valuable papers on "The Frontiers of India," in which he describes his journey, and the impressions made in the earlier part of it; F. I. Ricarde-Seaver and Sir Charles Metcalfe contribute a comprehensive article on "The British

Sphere of Influence in South Africa," illustrated with a map in colors; Professor Max Müller writes on "Some Lessons of Antiquity;" Mrs. Lynn Linton continues her series on "The Characteristics of English Women," and Mme. Blaze de Bury treats of "The Decadence of French Thought;" and J. D. Bourchier writes a timely paper on "The Heritage of the Hapsburgs." Other articles include "Australia in 1888," by the Earl of Carnarvon; "Obstruction and its Cure," by Sir G. Baden-Powell; and "The London Water-Supply," by Dr. Roose.

— A "History of West Virginia," from 1732 to the present time, has been written by Professor Virgil A. Lewis of Mason City, Mason County, W. Va. Only a limited number of copies will be published, and they will be sold by the author. "Professor Lewis," says the *Evening Post*, "has carefully examined all authentic rec-

ords of the State, the archives at Richmond, and those at county-seats, — in all, nearly one hundred. The first part of the book treats of the first permanent settlement in the Shenandoah valley, and comes down to the revolutionary war. Part second covers the ground between the Revolution and the civil war, and part third brings the narrative down to the present time."

— It is proposed to issue from time to time, in connection with the *Johns Hopkins University Studies in Historical and Political Science*, brief notes on current topics of interest. "Municipal Government in England," a report of an interview with Albert Shaw, Ph.D., was issued in January, 1889.

— *The Trained Nurse*, published from Buffalo, N.Y., suggests a new opening for professional nurses on board the large ocean-steamers, caring for seasick passengers.

Publications received at Editor's Office, March 4-23

- ALEXANDER, W. J. An Introduction to the Poetry of Robert Browning. Boston, Ginn & Co. 212 p. 12°. \$1.10.
 BERNHEIM, H. Suggestive Therapeutics: A Treatise on the Nature and Uses of Hypnotism. Tr. by C. A. Herter. New York and London, Putnam. 420 p. 8°. \$3.50.
 BONAPARTE, R. La Nouvelle-Guinée. III. Notice le Fleuve Augusta; IV. Notice le Golfe Huon. Paris, The Author. 78 p. 8°. \$1.75.
 BOWDITCH, H. P. Hints for Teachers of Physiology. (Guides for Science-Teaching, No. XIV.) Boston, Heath. 58 p. 24°. \$1.25.
 GALTON, F. Natural Inheritance. London and New York, Macmillan. 259 p. 8°. \$2.50.
 GILMAN, N. P. Profit Sharing between Employer and Employee. Boston and New York, Houghton, Mifflin, & Co. 466 p. 12°. \$1.75.
 GREAT DIVIDE, THE. Vol. I. No. 1. m. Denver, Col., Great Divide Publ. Co. 12 p. 1°. \$1 per year.
 GREENE, H. R. Greene's Language Half-Blanks. Graded Exercises in Analyzing and Diagramming. No. 1. The Sentence and its Four Principal Parts. New York, A. Lovell & Co. 43 p. 12°. \$1.60.
 HARDY, A. S. Elements of Analytic Geometry. Boston, Ginn & Co. 229 p. 12°. \$1.60.
 How to be Successful on the Road as a Commercial Traveller. By an old drummer. New York, Fowler & Wells Co. 83 p. 20 cents.

DRAGON'S TEETH.

Translated from the Portuguese by Mrs. MARY J. SERRANO. 12mo. \$1.50.

"Suggests the close detail, and even the nicety of touch, that distinguishes Daudet. It turns upon the temptation and unfaithfulness of a weak but loving woman. The plot is what we have learned to look upon as peculiarly French, and it is treated with French simplicity and frankness, without coarseness. It is a terrible presentation of the sure results of immorality. The slow retribution that follows the sin is remarkably depicted."—Nora Perry.

"A story of sin and its consequences powerfully set forth, and withal there is a great deal of humor in the story, a keen insight into the weaknesses of human nature that is delicious. It is wonderfully good. As a work of literary art, as a story, as a picture of life as it is lived under certain conditions, the book is a model."—Jeannette L. Gilder.

A Novel by the Author of "The Story of Margaret Kent."

A DAUGHTER OF EVE.

1 vol., 12mo, \$1.50.

"Exceptional cleverness, effective satire, a great deal of humor."—Boston Advertiser.

"A story that for rare merit and interest will surpass even either of this author's former novels that have won such a place in the literary world."—Home Journal.

"Graciously winning as was 'The Story of Margaret Kent,' brilliant and moving as was the tale of 'Queen Money,' we are strongly inclined to say, after reading 'A Daughter of Eve,' that the author has attained to a still more gratifying artistic triumph than in the case of either of the other two novels we have mentioned. Brillancy, sparkle and wit 'A Daughter of Eve' has in abundance, but it also has a definite ethical motive treated with inimitable taste."—Beacon.

Sold everywhere. Sent, postpaid, on receipt of price by the Publishers,

TICKNOR & CO., Boston.

STOCK, St. G. Deductive Logic. London and New York, Longmans, Green, & Co. 356 p. 16°. \$1.25.
 THORPE, F. N. The Government of the People of the United States. Philadelphia, Eldredge & Brother. 308 p. 12°. 90 cents.

A BOOK FOR THE TIMES!

NEW EDITIONS!

Laidlaw's Constitution of the United States and the Declaration of Independence, in English, French, and German, with notes. Sold by all book-sellers, or by the publishers, LAIDLAW BROS. AND CO., 137 W. 41st St., New York.

Second and Revised Edition, in cloth - - - - 50c. postpaid.
 Third Edition, in paper - - - - - 25c. postpaid.

The New Princeton Review

Having been merged into the Political Science Quarterly, a complete set of the New Princeton Review, eighteen numbers in all, is offered for \$2.50, regular price, \$9.00. Among the contributors are Bancroft, Lowell, Norton, Bryce, Tolstoj, Taine, Benjamin, Comte de Paris, Lathrop and Eggleston.

As the supply of complete sets is limited, those desiring to avail themselves of this low offer, should write at once to Ginn & Company, Publishers Political Science Quarterly, 743 Broadway, N.Y.

Just Published!

PRIMER OF SCIENTIFIC KNOWLEDGE.

Man, Animals, Plants, Stones, The Three States

of Bodies, Reading Lessons, Summaries,

Questions, Subjects for Composition.

BY PAUL BERT,

Author of "Bert's First Steps in Scientific Knowledge."

TRANSLATED AND ADAPTED FOR AMERICAN SCHOOLS.

Illustrated 12mo, cloth, 36 cents.

This new work is carried out in the same spirit as "First Steps in Scientific Knowledge," and follows the same plan. The book is so arranged that the larger work becomes a review and extension of the subject. The method, which consists in presenting to the child during two or three consecutive years the same subjects, in the same order, following the same general arrangement, but with an increasing number of facts and a progressive elevation of ideas, is an excellent one, and is now universally adopted.

The reductions have naturally been largely in Physics, Chemistry, and Vegetable and Animal Physiology. Yet, a somewhat fuller development has been given to the descriptive part of Natural History, and to applications easy to comprehend. These two works, then, depend upon each other. They form a coherent whole. The first prepares for the second, the second completes the first; at the same time each has its individuality, and can be used without the other.

In the present translation only such changes and additions have been made as were necessary to Americanize the book and adapt it to the requirements of public and private schools in this country.

The illustrations are for the most part entirely new. Those upon Natural History were drawn from life by some of our best artists.

Sent post-paid on receipt of price.

J. B. LIPPINCOTT COMPANY,

715, 717 Market Street, Philadelphia.

— The poem by Oliver Wendell Holmes, in honor of the dinner given to James Russell Lowell on his seventieth birthday, is the first thing to which the readers of the April *Atlantic* will turn. Mr. H. C. Merwin contributes a paper on "The People in Government;" and Mr. Samuel Sheldon answers the question "Why our Science Students go to Germany." Thomas Basin, Bishop of Lisieux, who suffered much at the hands of Louis XI., forms the subject of an article by Mr. F. C. Lowell; and William Cranston Lawton writes entertainingly of an archæological journey "From Venice to Assos." Miss Preston continues her series of articles by a paper entitled "Before the Assassination," giving an account of Cicero's closing years; and Miss Louise Imogen Guiney, under the name of "An Outline Portrait," writes a pleasant sketch about Lady Magdalene Herbert, mother to George Herbert. Mr. Hardy's serial, "Passe Rose," is concluded; Mr. James's "Tragic Muse" is continued, and the concluding portion of "Hannah Calline's Jim" also forms part of this number. The two short stories are "The King's Cup and Cake," by Sophie May, and "A Dissolving View of Carrick Meagher," by George H. Jessop. Mr. Bliss Carman, the young Canadian poet, contributes a long poem, "Death in April;" and Dr. T. W. Parsons, some verses called "In Eclipse." Criticisms of Renan's dramas and other recent books conclude the number.

— Sir Charles Dilke, in an article on "The Future of Russia," in the *Fortnightly Review* for March, says, "Not only is Russia the greatest military power in the world, but she is the European power with the largest homogeneous population and the greatest expansive force. Territorially she has the largest empire, possessing a vast share of the Old World; and hers is a people full of patriotic and religious spirit, and so well disciplined that all except an infinitesimal minority obey cheerfully and without question, under all circumstances, whether good or evil, the will of a single man. Yet, although subject to what, with our parliamentary ideas, we are disposed to style 'despotism,' the Russian people are full of spirit, and of those qualities which we consider specially Anglo-Saxon, — 'pluck' and 'go.' Russia has absorbed with rapidity, but with completeness, the greater part of central Asia, has drawn steadily nearer and nearer to our frontier, and has made herself extremely popular with the people she has conquered. Her policy throughout the century has been apparently fixed in object, but pursued with patience; and while there seems to be no reason to suppose any probability of a speedy collision, which England will do nothing to provoke, it is impossible for those who are charged with the defence of India to shut their eyes to the possibilities or even the probabilities of the future."

— The February number of the *American Journal of Psychology* opens with an interesting autobiography of a paranoiac, edited and commented upon by Dr. Frederick Peterson. The writer of the four-hundred-page manuscript book from which Dr. Peterson abstracts was a farm laborer, with a turn for study (he read Latin *con amore*) that helped to give him a remarkably direct literary style. The paper is interesting psychologically for the inside view it gives of the gradual development of his mental disease. Beginning life with hereditary predisposition, he grew up a hypersensitive and self-conscious child, a depressed and occasionally violent young man, suspicious of insult and persecution, contemplating murder in revenge, and finally reached the hallucinations and delusions of a typical paranoiac. His delusions of grandeur were colored by his reading of the Bible. First he found coincidences with his own experience. By degrees he recognized these less and less as coincidences, and regarded them more and more as prophetic, till at last he was ready to announce himself as the expounder of a new religion. His sufferings were the world's expiation, whence the title of his book, "The Piling of Tophet and the Trespass Offering." Though unable to correct his aberrations, he was a keen observer of his own mind, coherent, logical, and, like many of his class, not without at times a shadowy recognition of his true condition. The other two papers are continuations from the last number. Dr. W. H. Burnham brings down his survey of the doctrine of memory from Zanotti and his fantastic explanation of the association of ideas by their "electricity and magnetism," to Hering and Creighton. The theories held by the disciples of Hartley, by Kant and his followers, by the Scottish

school, by the English associationists, by the exponents of the "new psychology," are all considered; and finally, the modern theory of "organic memory," the beginnings of which, it appears, are to be found in Malebranche. Dr. E. C. Sanford discusses the variations produced in the amount of the personal equation by the kind of the heavenly body observed, by the magnitude of the star, by its rate and apparent direction of motion, and by the psychic and other conditions of observation. The reality of these changes seems demonstrable, and the law of their cause is not always clear. They furnish rather suggestive points for physiological and psychological research, than generalizations that can be taken ready-made into either science. This number contains the usual abundance of reviews and notes on psychological literature; "Nervous System," by Dr. H. H. Donaldson; "Hypnotism, Experimental and Abnormal," by Professor Joseph Jastrow. Rather prominent under the second heading are a number of abstracts from the rapidly growing literature of therapeutic hypnotism.

— The R. S. King Publishing Company, Chicago, have in press "The Story of America," by Elia W. Peattie, an historic narrative, arranged especially for young people. Many of the illustrations have been designed and engraved especially for this book. It is intended to be used as a text-book or supplementary reader in schools, as well as for general reading.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The editor will be glad to publish any queries consonant with the character of the journal.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The Soaring of Birds.

SINCE my return to Cambridge, I find that a rather extensive correspondence has collected upon the above subject. I admit the force of Mr. Gilbert's criticism on the medium with uniform motion, and, that being the case, need not defend the theory from the criticism of Professor MacGregor, further than to say that the force which he calls number (2) is not due to friction, and that he has misunderstood my meaning. As the original theory, in that form, is withdrawn, it is unnecessary to discuss it further in *Science*.

In regard to Mr. Gilbert's explanation, I must say that I cannot yet accept his horizontal-layer theory. The very essence of a bird's soaring is that he shall continually rise higher and higher, not continue to circle at one level. If the bird rises higher and higher, we must have a succession of these layers of air, the upper ones a few thousand feet from the ground moving with a velocity very much higher than is usually attributed to the clouds, or else a series of layers moving alternately fast and slowly, which seems to involve an hypothesis which we have no other ground save this theory for believing.

Moreover, if all the bird has to do is merely to dip from one moving layer of air into another, why should not small birds soar? Take the swallow, for instance, — a most excellent flier, and quite capable of travelling with outstretched wings for a few seconds; yet he is never known to maintain himself in the air circling for five or ten minutes at a time, or by the hour together, as do the larger birds.

But why make any new assumptions with regard to the atmosphere? Why not take the phenomena with which we are all of us familiar? Whenever there is a high wind, such as is undoubtedly required by a soaring bird, we know that the air-pressure is not uniform, that the wind comes in gusts. Those familiar with mountain summits know that the same phenomena are observed in the upper atmosphere as at the surface of the ground. If we were travelling along with such a wind in a balloon, the gusts would not be so severe, but they would be of longer duration.

A ————— B

Imagine, now, a bird travelling from A to B, in the same direction as the wind, and with its mean velocity. When the wind is uniform, it seems to him that he is in a dead calm. When a gust comes, the wind seems to blow from A. It carries him along faster; and when it ceases, the wind seems to blow from B. It therefore affects him precisely as if he were in an alternating current of wind.

Suppose, now, that he is drifting towards *B* with a velocity equal to that of the wind, and travelling at right angles to *AB* with such a velocity that he can move along horizontally without falling towards the earth. Suddenly a gust overtakes him from the direction of *A*. He at once turns towards it, and his velocity relative to it is sufficient to raise him in the air. It tends to carry him more rapidly towards *B*; and when his velocity relative to it has sunk to the same value as before, and he again travels horizontally, he turns again at right angles to the line *AB*, but in the opposite direction to that which he had before. Presently the force of the gust diminishes, and the wind seems to blow towards him from the direction *A*. He accordingly turns towards it again, rising from the ground till his velocity relative to the air has assumed its former value, and he moves horizontally, turning again at right angles to the line *AB*, and the cycle is completed. He thus moves along in the direction *AB* with a mean velocity equal to that of the wind, rising when moving parallel to it, and moving horizontally, or perhaps slowly falling, if the gusts do not come with sufficient frequency, when moving at right angles to it.

In the case of all soaring birds, the spread tail, being an inclined curved surface, presents a large area to the wind. As it is situated at a considerable distance from the bird's centre of gravity, it must convert him into a sort of floating weather-cock, the wings serving as dampers to restrain him from turning too quickly. It therefore appears, if soaring really does depend on the interaction of varying wind-currents, as if the changes of direction involved must be almost automatic, and not a thing which the bird is required to learn; although he may doubtless learn to take advantage of favoring currents by giving proper inclinations to his wings and tail.

If the question be raised as to the sufficiency of the varying intensity of the wind-currents to maintain the bird's initial velocity against the resistance of the air, we must reply that it is a matter which can only be determined conclusively by experiment. Certain it is, however, that in windy weather the wind does come in gusts. If in the course of his circles the bird happens to be travelling at right angles to the wind, when the gust strikes him he will surely be turned round, almost in spite of himself, so as to face the gust. If the bird does face the gust, it will certainly raise him to a higher level.

If this explanation proves to be the true one, the reason why small birds cannot soar is probably, that, in those of them that have suitably shaped wings and bodies, their surfaces are so large in proportion to their weights that they rapidly assume the velocity of the surrounding air. In order that they might soar to advantage, the gusts should come more frequently, and be of shorter duration, than we actually find to occur in nature.

WM. H. PICKERING.

Harvard Observatory, Cambridge, Mass., March 21.

Definition of Manual Training.

I HAVE just seen in your pages (*Science*, xiii. p. 9) the excellent definition of "manual training," given by the New Jersey Council of Education. But the name is already too familiar in various vaguer uses, and especially for training to fit for manual labor: hence there would be great advantage if a fresh name were applied. Would not "manu-mental training" do admirably? It expresses the precise idea in such a way that a mistake as to its meaning is impossible.

J. E. CLARK.

Bootham, York, Eng., March 15.

Curves of Literary Style.

AFTER reading the communication on "Curves of Literary Style," in the last number of *Science*, I counted the words in 300 sentences towards the last of Carlyle's "French Revolution," and found the curve, when plotted, to agree very closely with your correspondent's as published, though there were several longer sentences interspersed, showing that the passages examined were from a different part of the work. This was very satisfactory; but the same method of examination, applied to the first 300 sentences of Carlyle's "Sartor Resartus," gives a very different result, the curve corresponding pretty closely with that given for Johnson's "Rambler." This goes to show, if it does not prove, that for detective purposes

the method is valueless. All compound words and phrases connected by hyphens were counted as single words only. The 300 sentences filled 30 out of 200 pages of the edition used.

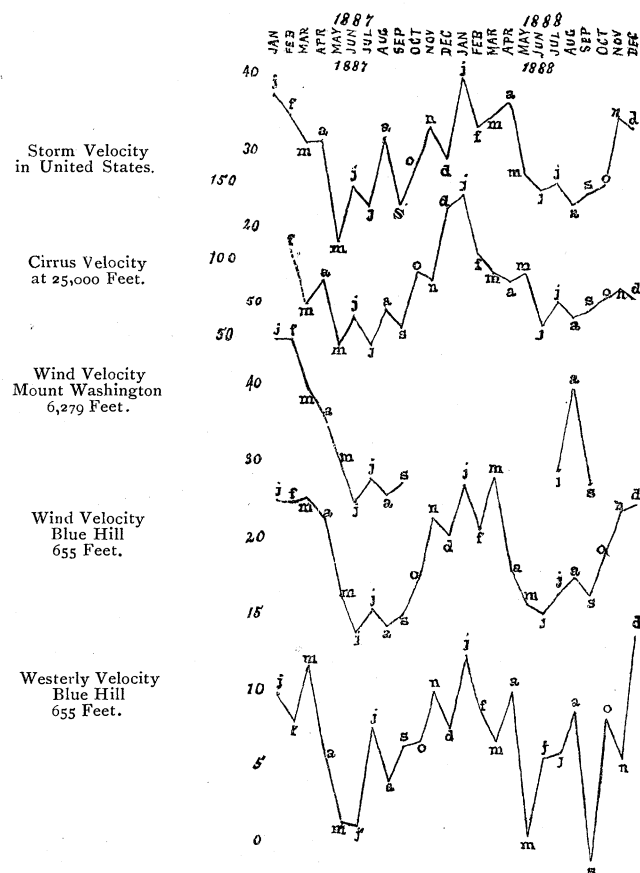
H. A. PARKER.

Cambridge, Mass., March 25.

The Velocity of Storms as related to the Velocity of the General Atmospheric Movements.

It has for a long time been maintained by some meteorologists that the chief cause of the progressive movement of storms is that these atmospheric disturbances are carried along by the general movements of the atmosphere, as eddies on the surface of a river are borne along by the current in which they exist. The German meteorologists Van Bebber and Köppen have especially insisted on these views, maintaining that the direction and velocity of storms are determined by the mean motion of the entire atmosphere in which they exist; and Gen. Greely has recently, in the *American Meteorological Journal*, echoed the recorded wind-velocities on Mount Washington as favoring this view.

In order to study this and allied questions, the writer began two years ago a systematic series of observations on the clouds. These observations were made hourly between 7 A.M. and 11 P.M. Facil-



ities were not available for obtaining the actual velocities of the clouds, and it was hence necessary to be content with obtaining the apparent velocities. These were obtained by means of a nephoscope devised by the writer. The nephoscope consists of a horizontal mirror held in a frame carrying an eye-piece movable along vertical and horizontal arches, so that the direction of cloud-movements can be determined in degrees of azimuth. To obtain the relative velocity, a movable support is so arranged, that, when the observer's forehead is rested on it, the retina of the eye is maintained at a constant height of seven inches above the surface of the mirror. When the eye is in this position, the number of quarter-inches which the image of a cloud is seen to move across the mirror in a minute is taken as the relative velocity of the cloud. It is evident that the relative velocity of the cloud thus obtained bears a relation to the actual velocity; and, if the height of the cloud be known, its absolute velocity relative to the earth's surface

can be calculated. From measurements made at Upsala and elsewhere, it seems safe to assume that the average height of the highest form of clouds, which are known as cirrus and cirro-stratus, is 25,000 feet as a minimum estimate; and on this basis it is calculated by the writer, according to known geometrical principles, that, if the relative velocities obtained by him for this form of cloud be multiplied by ten, they will represent approximate absolute velocities. This, however, does not alter, but merely increases, the number of divisions in the scale used for the observed relative velocities; and, even if the attempt to express the results in approximate absolute velocities is erroneous, it does not alter the main conclusions of the following article, which are based on the measured apparent velocities of the cirrus as seen from the earth's surface.

Observations on the relative velocity of the clouds were begun in February, 1887; and during the two years 1887 and 1888 there were obtained 1,821 observations of the relative velocity of the cirrus level of clouds, distributed as follows:—

	1887.		1888.	
	No Days.	No. Observ.	No. Days.	No. Observ.
January.....	0	0	19	58
February.....	3	12	18	74
March.....	11	39	18	59
April.....	21	61	19	89
May.....	23	131	16	91
June.....	21	124	23	163
July.....	25	107	22	117
August.....	19	102	2	110
September.....	10	44	13	73
October.....	17	78	14	54
November.....	19	89	15	49
December.....	10	33	18	64
Year.....	179	820	217	1001

To correct for irregularities in the intervals between observations, the months were divided into six periods of about five days each, and averages for each period determined. From the average of these the monthly average was obtained. During the two years there were only three of these periods of five days within which no observations of the cirrus velocity were obtained.

The following numbers obtained as stated above express approximately in miles per hour the average monthly velocity of the cirrus obtained during two years (February, 1887, to January, 1889): January, 120; February, 106; March, 80; April, 85; May, 67; June, 58; July, 57; August, 64; September, 60; October, 81; November, 81; December, 102; year, 80.

Individual velocities exceeding 200 miles per hour were not uncommon in the winter months; and, even if these very rapidly moving cirri did not exceed 20,000 feet in height, their velocities must have been greater than 150 miles. In the accompanying diagram are plotted for each month during nearly two years the following data: the average monthly storm-velocities in the United States, as obtained from the United States Signal Service *Weather Review*; the average monthly velocity of the cirrus observed at Blue Hill Observatory; the average wind-velocity obtained during a part of this time on Mount Washington; the average wind-velocity obtained at Blue Hill Observatory; and the average westerly component of the Blue Hill wind-velocity. The westerly component was calculated by multiplying the north-west and south-west winds observed at Blue Hill by $\cos 45^\circ$, and adding the results to the wind-movement from the west, then subtracting from this the easterly wind-movements treated in the same manner. The result gave the excess of the westerly component of the atmospheric movement.

The observed direction of the cirrus movement was almost invariably from some westerly point, movements from the east only

being observed on about a dozen days during the two years: hence no correction for direction was attempted.

It is seen that all of the curves follow the same general sweep, indicating that the velocity of storms is intimately related to the velocity of movement of the general atmosphere; but the most intimate relation between the two is evidently in the cirrus region. The curves show that almost every increase or decrease in cirrus-velocity was coincident with a corresponding increase or decrease of storm-velocity. The first letters of the months are placed along the curves so that the corresponding parts can be more easily followed. In general, the minor oscillations of the curves representing the lower winds were in opposite direction to those of the cirrus; but it seems worthy of notice that the only part of the storm-curve which differed from the cirrus-curve followed very closely the curve showing the westerly movement of the wind at Blue Hill.

In order to determine whether the relation between the upper air movements and the storm-velocity was a constant, the months which showed average cirrus-velocities between 30 and 50 miles per hour, were combined and averaged, as were also the average storm-velocities for these same months. In the same manner the cirrus-velocities between 50 and 70 miles, and the storm-velocities for the same months were averaged; and so for each 20 miles of increased velocity of the cirrus-level. The following table gives the results:—

Cirrus-velocity.....	30-50	50-70	70-90	90-110	130-150
Average.....	44	61	80	94	136
Storm-velocity.....	20	25	30	32	34
Ratio.....	2.2	2.4	2.7	2.9	4.0

This shows that the cirrus-velocities increased more rapidly than the storm-velocities. A more detailed study, which is not given here, showed that this held true for winter as well as summer, and also showed that the most frequently observed cirrus-velocity was about 60 miles per hour.

A similarly prepared table showed that the storm-velocity increased more rapidly than the wind-velocity at Blue Hill; while the ratio between the two at the height of Mount Washington seems to be almost a constant (see *American Meteorological Journal* for December, 1888).

The following table, prepared in the same manner as that above, shows how intimately also the variability of the weather is connected with the velocity of the cirrus. The variability of the pressure and temperature at Blue Hill Observatory was found by ascertaining how much the means of consecutive days differed from each other, and averaging the results without regard to sign. The variability of rain was calculated on the basis that rain on every alternate day would make 100 per cent:—

Cirrus-velocity.....	30-50	50-70	70-90	90-110	130-150
Average (in miles).....	44	61	80	94	136
Mean daily change in pressure.....	0.11 in.	0.12 in.	0.18 in.	0.19 in.	0.23 in.
Mean daily change in temperature.....	3.8°	4.2°	5.3°	6.4°	7.8°
Rain variability (in per cent)...	19	37	39	31	51

There has been a striking contrast between the velocity of the cirrus observed during the winter of 1887-88, and during the winter of 1888-89 up to the present time; and this is no doubt correlated with a striking contrast in the distribution of temperature during the two winters. During the winter of 1887-88 the temperature in the northern part of the United States was decidedly below normal, while in the southern part it was above. This, no doubt, very much increased the normal pressure-gradient from the equator toward the pole in the upper air; and as a consequence the upper-air movement was very rapid, carrying the cyclonic eddies along with exceptional rapidity, and causing rapid and violent fluctuations in the temperature, rainfall, humidity, etc., over the entire United States except the Pacific coast. On the other hand, during

the winter of 1888-89 the temperature has been decidedly above the normal in the northern United States, and normal or below normal in the Southern States. As a consequence the pressure-gradient in the upper air has been less steep than usual, the movements of the upper-air currents and of storms has been comparatively slow, and the winter over the entire country exceptionally free from sudden changes. The correlation of these facts seems to the writer to promise much; for, when the causes governing the distribution of temperature are better understood, it seems evident that the meteorologist will be able to foretell for considerable intervals the special characteristics of the weather to be expected over large areas.

I trust these few facts may serve to further stimulate the interest which is now being aroused in more exact and detailed cloud-observations.

H. HELM CLAYTON.

Blue Hill Observatory, Readville, Mass., March 20.

The Robinson Anemometer Factor.

THIS name has been commonly applied to the earliest expression of the law of relation between the velocities of the centres of the cups of the Robinson anemometer and that of the wind which sets them in rotation. Being a simple ratio between the two velocities

in question, or $\frac{w}{v}$ as expressed in *Science* (xiii. p. 227), it is not

surprising that subsequent experiments should show, that not only is the original factor, namely 3, incorrect, but that such a simple relation can by no means be made to express with any reasonable accuracy the anemometer law. It is surprising, however, considering the numerous experiments made by Dohrandt as well as others, that writers and investigators of the present day should still adhere to the use of the old anemometer "factor," and group together in a general mean a large number of experiments at different velocities.

The writer of the communication referred to above, in a discussion as to just what constitutes the true anemometer factor, has presented the matter in a form that shows at once how futile it is to use the old factor. Following Dohrandt and others, he assumes that the velocity of the wind, w , and the velocity of the cup-centres, v , bear the following relation to each other:—

$$w = a + bv \quad (1),$$

in which a and b are constants. The anemometer factor then becomes

$$x = \frac{w}{v} = \frac{a}{v} + b.$$

We see from this equation, that, when $w = a$, x becomes infinite, which corresponds to the condition when the wind is just too feeble to start the cups. As w increases, x approximates more and more to the value of b ; but, even between the small ranges of velocities that occur in ordinary practice, x is entirely too variable to consider constant, as shown by the values given in the above-mentioned paper, and is too troublesome to use in calculation, especially since the very equation from which it is computed is in much simpler form, and, moreover, gives at once the velocity of the wind from the cup-velocity, which is the quantity observed when the anemometer is in use. The facts of the case, however, are not satisfied with even this degree of complication, and the anemometer factor becomes quite out of the question. Dohrandt's results up to 30 miles per hour are only approximately represented by an equation like (1); and as in his experiments, owing to the comparative shortness of the whirling arm, the friction of the anemometer at high velocities, from centrifugal action, was very great, it may be shown that the approximation is even closer than it actually should be. In fact, recent anemometer experiments upon a whirling arm 35 feet long are in most cases represented accurately by an equation of three terms: thus,

$$w = 0.225 + 3.14v - 0.0362v^2 \quad (2),$$

the numerical values being those computed for an anemometer of the Signal Service pattern, the cups of which are 4 inches in diameter on arms 6.7 inches long.

In view of this discussion, and taking into consideration that the experiments just mentioned were made in a closed court under the

most favorable circumstances, it would appear that the different conclusions reached by the wind force committee of the Royal Meteorological Society in their open-air experiments are largely misleading and in error, due probably to the serious influence of the outside wind-movement.

It seems that one effect of this wind-movement, outside of the motion of the arms of the whirling-machine, is not clearly understood, or at least receives little attention, and is nevertheless of the greatest importance.

If a uniform wind blows across the path of the anemometer when being carried upon the whirling-machine, every one sees, that, during one half of its motion, the anemometer is going more or less with the wind, and against it during the remaining half. That these effects do not fully neutralize each other, is clearly shown in a mathematical analysis by which it is not difficult to find the correction that should be applied; but this is only small in most cases, and is not very serious. A far greater error arises from the effect this extra wind has in causing a very large and rapid variation in the actual wind-movement experienced by the anemometer, which, if its axis is being revolved on the whirler at the rate of 15 miles an hour, and an extra wind of 4 miles per hour is blowing, is at one point of its path moving through the air at the rate of 19 miles an hour, and at the opposite point at the rate of only 11 miles per hour; the change, moreover, from the maximum to the minimum being accomplished with great rapidity. The mean velocity of the cups in this case may be shown to be such as corresponds to a wind-velocity of nearly 19 miles per hour, the reason being that the inertia of the cups keeps them spinning after experiencing the maximum velocity; so that during the minimum velocity they do not slow up as they should, the only tendency to do this being the air resistance to the backs of the cups; and, as this is considerably less than that felt by the front or concave sides of the cups when the wind tends to increase their velocity, it must follow that the mean velocity of the cups in a variable current is considerably higher than such as would otherwise occur. A more extended statement of this inertia effect, and numerous experiments by which the theory is confirmed, have been already submitted for publication in the *American Meteorological Journal*.

The large and erratic variations in the results obtained by the wind force committee with anemometers of the Robinson type are to be attributed to this cause; and the noticeably more uniform results obtained with the helicoid anemometer were due to the fact that this instrument, being driven by the direct pressure of the wind, and not by the difference of several pressures as is the case with the Robinson anemometer, is not subject to the inertia effect just described. The explanation of this point, given in *Science* of March 22, p. 227, to the effect that the helicoid anemometer was tested with a vane attached to keep it in the wind, is hardly sufficient to account for its seeming better performance.

It follows from the above, that, if two sets of anemometer cups are fitted up exactly alike except in weight, one having paper cups, for instance, the latter will in the open air, exposed to a variable wind, give seemingly less wind than the former, both being reduced by the same formula. Formula (2) given above is also only to be used for perfectly uniform currents.

Some mention was made in a "Note on the Robinson Anemometer Constant," in *Science* of March 15, of the relative merits of the recently invented helicoid anemometer and those of the Robinson type. Judging by the description of the former, its mechanical construction cannot possibly be so simple as that of the latter; and as to what would happen to it and its delicate self-adjusting vanes when exposed to the sleet and frost of a winter season, is by no means difficult to tell. The inventor himself considers the instrument defective or unsatisfactory, owing to the ease with which the readings are altered by bending the vanes.

Robinson anemometers, to give the most satisfactory results in the open air, and variable winds, should have very light cups.

It may be added, in conclusion, that all anemometers acting by direct wind-pressure are subject in much greater degree to variations in their law connected with temperature and pressure changes than are those depending only on difference of pressures.

C. F. MARVIN

Washington, D.C., March 25.

GUARANTY INVESTMENT COMPANY

CAPITAL \$250,000.

Offices: Atchison, Kan. 191 Broadway, New York. 222 Walnut St., Phila.

Hon. ALBERT H. HORTON (Chief Justice, Kansas Supreme Court), Topeka, Kan., Pres't.

7% Guaranteed Farm Mortgages 7%

The Guaranty Investment Company makes loans upon fertile farms in the choicest portions of Kansas and Nebraska and has adopted the policy of sending a Committee of its Investors each year to examine its loans and methods of business.

The Committee this year consisted of PROF. A. H. BERLIN, Principal of the High School Montrose, Pa., and MAJ. THEODORE L. POOLE, Ex-U. S. Pension Agent, Syracuse, N. Y. Both of these gentlemen are persons of the highest character and have the confidence of the Communities in which they reside.

The Committee has recently returned and has made a very interesting Report upon the general development of Kansas and Nebraska as well as the business of the Company. The Company will be glad to send this Report to any address.

The following names are taken from the long list of Investors in our Mortgages:

(See if Some Friend of Yours is not in the List.)

William A. Cauldwell, 59 Liberty St., N.Y.
Palmer Cox, 658 Broadway, N.Y.
Rev. Jos. H. Kylanee, D.D., 11 Livingston Place, N.Y.
Rev. Brady E. Backus, D.D., 360 West 28th St., N.Y.
Rev. R. M. Sommerville, 126 West 45th St., N.Y.
Dr. Robert A. Murray, 235 West 23d St., N.Y.
Dr. James P. Tuttle, 136 West 41st St., N.Y.
H. Edwards Rowland, 218 Fulton St., N.Y.
Irving H. Lift, Esq., 271 Broadway, N.Y.
Prof. D. G. Eaton, 55 Pineapple St., Brooklyn, N.Y.
Dr. E. P. Thwing, 156 St. Marks Ave., Brooklyn, N.Y.
Dr. C. C. Miles, Greenport, N.Y.
John V. N. Bergen, Port Jefferson, N.Y.
Benj. W. Stilwell, Yonkers, N.Y.

R. C. Coleman, Goshen, N.Y.
Mrs. Samuel Carlisle, Newburg, N.Y.
Dr. C. C. Bartholomew, Ogdensburg, N.Y.
Rev. Nelson Millard, D.D., Rochester, N.Y.
Rev. Horace G. Hinsdale, D.D., Princeton, N.J.
Dr. Charles M. Howe, Passaic, N.J.
George A. Skinner, 5 Railroad Place, Newark, N.J.
Dr. Edwin M. Howe, 85 Halsey St., Newark, N.J.
Dr. H. G. Buckingham, Clayton, N.J.
Dr. Martin Cole, Jr., Hainesville, N.J.
Mortgage Trust Co. of Pa., Philadelphia, Pa.
Miss Mary Miller, 1230 Spruce St., Philadelphia, Pa.
Henry D. Biddle, 311½ Walnut St., Philadelphia, Pa.

Dr. Calvin C. Halsey, Montrose, Pa.
Rev. William Baldwin, Great Bend, Pa.
Gen. William Lilly, Mauch Chunk, Pa.
Second Nat. Bank, Mauch Chunk, Pa.
Enos E. Thatcher, West Chester, Pa.
Mrs. Townsend Poore, Scranton, Pa.
Rev. Burdett Hart, D.D., New Haven, Conn.
Dr. Frank H. Wheeler, New Haven, Conn.
Charles R. Christy, Stamford, Conn.
Mrs. Catharine P. Fuller, Woodmont, Conn.
Miss Jessie Henderson, Lenox, Mass.
Dr. M. J. Halloran, Worcester, Mass.
Albert Walker, Bennington, Vt.

Address for Report and Monthly Bulletin

HENRY A. RILEY, General Eastern Manager, 191 Broadway, N.Y.

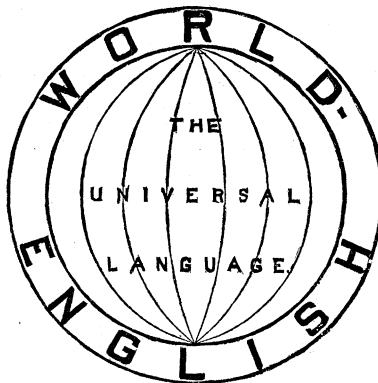
ONE LANGUAGE FOR THE WHOLE WORLD.

WORLD-ENGLISH :

THE UNIVERSAL LANGUAGE. 25 CENTS.

EVERY one has heard of the butcher who, after a long search for his knife, at last found it in his mouth : so speakers of English have been seeking for a universal language, when, lo ! it is in their mouths. The intelligibility of English words has been obscured by a dense mist of letters. This is now dispersed by A. Melville Bell, who has already won a world-wide reputation through his invention of "Visible Speech," the great boon to deaf-mutes. Professor Bell calls this new discovery of his "World-English," and the result is a language which cannot fail to meet with acceptance, and at once supersede the supposed necessity for "Volapük," or any other artificial language. No language could be invented for international use that would surpass English in grammatical simplicity, and in general fitness to become the tongue of the world. It is already the mother-tongue of increasing millions in both hemispheres, and some knowledge of the language is demanded by all educated populations on the globe. Social and commercial necessities require that the acquisition of this knowledge shall be facilitated, and it is believed that Professor Bell's invention has removed the last impediment to English becoming the universal language, for which vague desires have long been entertained, although hitherto only futile efforts have been made.

Ex-President Andrew D. White, of Cornell University, says : "I believe that the highest interests of Christian civilization and of humanity would be served by its adoption. China and Japan would be made English-speaking peoples within fifty years, and so brought within the range of Christianizing and civilizing ideas, in the largest sense. All existing missionary work is trivial as compared with this. For your system would throw wide open those vast countries, as, indeed, all the countries of the world, to the whole current of English and American thought."



For Diffusion of English throughout the World

AS
THE UNIVERSAL LANGUAGE

This "Hand-Book of World-English" is the Complete, Simple, and Efficient Medium.

FOREIGNERS

Will Acquire, by Means of this Hand-Book, a
PERFECT PRONUNCIATION OF ENGLISH.

For Primary School Pupils and Illiterate Adults

World-English is a Royal Road to Reading.

To Teachers of English and Modern Languages

This Hand-Book will be of Primary Importance as a Phonetic Directory.

DEFECTS OF SPEECH

Will be Readily Corrected by Means of the Articulative Directions in this Hand-Book.

HAND-BOOK OF WORLD-ENGLISH, 25 CENTS.

The plan of this little book is altogether new. Letters and sounds are so associated, in all the exercises, that from the mere knowledge of letters a learner cannot fail to pronounce words with certainty. English reading will thus be easily acquired, whether by natives or foreigners, children or adults.

The general resemblance of World-English to Literary English is such that any reader of the latter deciphers the former at sight, or, at most, after a few minutes' study of the new letters. A like result may be anticipated for those who shall learn to read from World-English. They will transfer their power of reading to the literary form of the language, almost without effort. The orthographic aspect of words will, besides, be so fixed in the eye, by contrast, that spelling will be remembered as — what it really is — a pictorial association with words.

No special training is required to qualify teachers for using this book. The subject can even be successfully introduced in the kindergarten and the nursery. This phonetic mode of initiation in reading cannot be too strongly urged on the attention of School Boards on both sides of the Atlantic.

The ordinary orthography of each word is interlined with the World-English version throughout the Exercises and Readings.

So set down, our tongue is the best for the world to unite upon.—*Brooklyn Eagle*.

The idea of Mr. Bell has much to recommend it, and the presentation is charmingly clear.—*American, Phila.*

The result is a language which cannot fail to meet with acceptance.—*Boston Traveller*.

Has the merit of great ingenuity.—*Railway Age*.

His treatise, as a study of English orthoepy, condenses the result of much thought and experience in small compass.—*The Critic*.

World-English deserves the careful consideration of all serious scholars.—*Modern Language Notes*.

World-English is the English language unburdened of its chaotic spelling.—*Popular Science Monthly*.

We commend it to the attention of teachers.—*Ottawa Globe*.

"World-English" and "Hand-Book of World-English" can be had of all booksellers, or will be sent for 50 cents, post free, by the publisher,

N. D. C. HODGES, 47 Lafayette Place, New York.

The Make-up of
SCIENCE
has been
changed recently to
render it
MORE ATTRACTIVE

—:0:—

For SALE
on the
News Stands.

Any one who will have the following blank filled out by a responsible Newsdealer, and mailed to us, will be allowed a three months' subscription to *Science*.

N. D. C. HODGES,
47 LAFAYETTE PLACE, NEW YORK.

To the News Company.

You may add to my regular order five copies of SCIENCE
each week (returnable).

A NEW MAGAZINE—THE SWISS CROSS
Devoted to spreading a love of nature among the people. Edited by HARLAN H. BALLARD, President of the Agassiz Association, and succeeding *St. Nicholas* as the official magazine of that body. \$1.50 a year. Sample copy 10 cents, or 25 cents for trial subscription for 3 months.
N. D. C. HODGES, PUBLISHER,
Mention this paper. 47 Lafayette Place, New York.

Wants.

A YOUNG MAN can have lucrative engagement, not only a fixed salary, but according to his work accomplished in travelling for SCIENCE. A personal interview invited.
N. D. C. HODGES,
47 Lafayette Place, New York.

Old and Rare Books.

A. S. CLARK, Bookseller,
34 PARK ROW, NEW YORK CITY.
A Gleaner in the By-ways of Literature. Results of Gleaning found in Catalogues issued from time to time.
CATALOGUE NO. 27 NOW READY.

BACK NUMBERS and complete sets of leading Magazines. *Rates low.* AM. MAG. EXCHANGE, Schoharie, N.Y.

H. WILLIAMS,
Dealer in Old Magazines, Reviews, &c. Scientific periodicals a specialty. 39 Macdougall St., N.Y.



PETER COOPER'S GLUE.
Prepared in liquid form by the N.Y. Liquid Glue & Adhesive Co. The long and well-known reputation of this glue for its strong adhesive properties requires no recommendation. It is the glue your furniture is glued with, and never fails to join the hardest of wood if properly applied. Always ready for use. For sale everywhere.
CONTAINS NO ACID.

Unalterable & Fragrant
GLUE PASTE

A strong and harmless preparation of flour and glue for Photographers, Manufacturers, Merchants, Insurance Companies, Banks, and family and office use. Contains no acids. Unlike Mucilage, adheres and dries immediately. N. Y. Liquid Glue and Adhesive Co., Preparers of Peter Cooper's Glue in Liquid Form, 18 N. William St., New York. *Used in this office.*

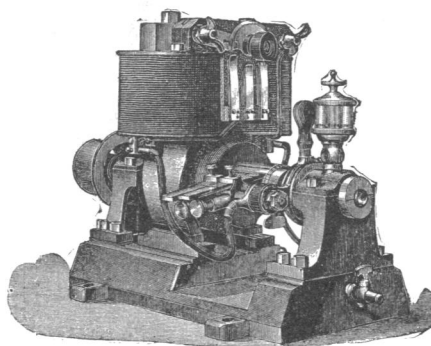
SCIENCE CLUBBING RATES.

10% DISCOUNT.			
We will allow the above discount to any subscriber to <i>Science</i> or <i>The Swiss Cross</i> who will send us an order for periodicals exceeding \$10, counting each at its full price.			
	Year's Subscription.	With Science.	With The Swiss Cross.
American Agriculturist.....	\$ 1.50	\$ 4.30	\$ 2.50
American Analyst.....	1.00	4.25	2.25
American Architect and Building News.			
Imperial edition.....	10.00	12.80	11.00
Gelatine ".....	7.00	9.80	8.00
Regular ".....	6.00	8.80	7.00
American Garden.....	1.00	4.25	2.25
American Journal of Philology.....	3.00	5.25	4.25
American Machinist.....	2.50	5.30	4.50
American Magazine.....	3.00	5.80	4.00
American Naturalist.....	4.00	7.50	5.50
Andover Review.....	4.00	6.80	5.00
Atlantic.....	4.00	6.80	5.00
Babyhood.....	1.50	4.30	2.50
Babyland.....	.50	3.75	1.75
Bradstreet's.....	5.00	7.80	6.00
Brain.....	3.50	6.30	4.50
Building (weekly).....	6.00	3.80	7.00
Carpentry and Building.....	1.00	4.25	2.25
Century Magazine.....	4.00	6.80	5.00
Chautauquan, The.....	1.50	4.30	2.50
Christian Union, The.....	3.00	5.80	4.00
Christian Weekly, Illustrated.....	2.50	5.30	3.50
Cosmopolitan, The.....	2.00	4.80	3.00
Critic.....	3.00	5.80	4.00
Doctor.....	2.00	4.80	3.00
Eclectic Magazine.....	5.00	7.80	6.00
Edinburgh Review.....	4.00	6.80	5.00
Electrical World.....	3.00	5.80	4.00
Electrician and Electrical Engineer.....	3.00	5.80	4.00
Electrical Review.....	3.00	5.80	4.00
Engineering and Mining Journal.....	4.00	6.80	5.00
English Illustrated Magazine.....	1.75	4.55	2.75
Family Story Paper (N.Y.).....	3.00	5.80	4.00
Forest and Stream.....	4.00	6.80	5.00
Forum, The.....	5.00	7.80	6.00
Godey's Lady's Book.....	2.00	4.80	3.00
Harper's Bazar.....	4.00	6.80	5.00
Harper's Magazine.....	4.00	6.80	5.00
Harper's Weekly.....	4.00	6.80	5.00
Harper's Young People.....	2.00	4.80	3.00
Health and Home.....	1.00	4.25	2.25
Herald of Health.....	1.00	4.25	2.25
Illustrated London News (Amer. reprint).....	4.00	6.80	5.00
Independent, The.....	3.00	5.80	4.00
Inter Ocean, The.....	1.00	4.25	2.25
Iron Age (weekly).....	4.50	7.30	5.50
Journal of Philology (Eng.).....	2.50	5.30	3.50
Journal of Speculative Philosophy (begins with Jan. No.).....	3.00	5.80	4.00
Judge.....	4.00	6.80	5.00
L'Art.....	12.00	14.80	13.00
Life.....	5.00	7.80	6.00
Lippincott's Magazine.....	3.00	5.80	4.00
Littell's Living Age.....	8.00	10.80	9.00
Little Men and Women.....	1.00	4.25	2.25
London Quarterly.....	4.00	6.80	5.00
Macmillan's Magazine.....	3.00	5.80	4.00
Magazine of American History.....	5.00	7.80	6.00
Medical and Surgical Journal.....	5.00	7.80	6.00
Mechanical Engineer.....	2.00	4.80	3.00
Metal Worker.....	1.00	4.25	2.25
Microscope, The.....	1.00	4.25	2.25
Nature.....	6.00	8.80	7.00
New Princeton Review.....	3.00	5.80	4.00
North American Review.....	5.00	7.80	6.00
Outing.....	3.00	5.80	4.00
Overland Monthly.....	4.00	6.80	5.00
Pansy.....	1.00	4.25	2.25
Political Science Quarterly.....	3.00	5.80	4.00
Popular Science Monthly.....	5.00	7.80	6.00
Popular Science News.....	1.00	4.25	2.25
Portfolio, The.....	7.50	10.30	8.50
Practitioner.....	3.50	6.30	4.50
Public Opinion.....	3.00	5.80	4.00
Puck.....	5.00	7.80	6.00
Puck (German).....	5.00	7.80	6.00
Quarterly Review (London).....	4.00	6.80	5.00
Queries.....	1.00	4.25	2.25
Rural New-Yorker.....	2.00	4.80	3.00
St. Nicholas.....	3.00	5.80	4.00
School Journal.....	2.50	5.30	3.50
Scientific American.....	3.00	5.80	4.00
Supplement.....	5.00	7.80	6.00
Architect and Builders' edition.....	2.50	5.30	3.50
Scribner's Magazine.....	3.00	5.80	4.00
Southern Cultivator.....	1.50	4.30	2.50
Springfield Republican (weekly).....	1.00	4.25	2.25
Sunday School Times.....	2.00	4.80	3.00
Teachers' Institute.....	1.25	4.05	2.25
Texas Siftings.....	1.00	6.80	5.00
Treasure-Trove.....	1.00	4.25	2.25
Truth Seeker, The.....	3.00	5.80	4.00
Wide Awake.....	2.40	5.20	3.40
Young Folks' Journal.....	1.00	4.25	2.25

N. D. C. HODGES,
47 Lafayette Place,
New York.

C. & C. ELECTRIC MOTOR COMPANY.

Electric Motors
FOR
Arc and Incandescent Cir-
cuits, Most Economi-
cal Motor on the
Market.
Regulation Perfect.
Motors Designed for all
Power Purposes.



OFFICE and MANUFACTORY:
402 and 404 Greenwich Street, New
York City.
New England Office, 19 Pearl St., Boston.
Philadelphia Office, 301 Arch St.
Western Office, 139-141 Adams Street
Chicago.
Southern Office, 25 Carondelet Street,
New Orleans.

Schools.

NEW JERSEY, PLAINFIELD.
THE CHESTNUTS.—Parents with daughters to edu-
cate, or orphan girls with companion, may find a
comfortable home, with school instruction by applying to
Miss E. E. Kenyon.

NEW YORK CITY, N. Y.
BOTANY, MICROSCOPY—PRACTICAL courses
at the New York College of Pharmacy open for
ladies and gentlemen from April 10 to end of June, in-
cluding botanical excursions and individual instruction
in microscopic work. For particulars apply to College,
209-213 East 23d St., or to PROF. J. SCHRENK,
Hoboken, N. Y.

CONNECTICUT, NEW HAVEN,
MRS. CADY'S SCHOOL FOR YOUNG LADIES.
Prepares for Smith and Wellesley, and admits to
Vassar by Certificate. Circulars. Early application
necessary.

VERMONT, BURLINGTON.
VERMONT EPISCOPAL INSTITUTE. Boarding
School for Boys. Prepares for College or Business.
Military drill. Terms moderate. Fifty-seventh half-
year opens September 3, 1888. Send for catalogue.
H. H. ROSS, A.M., Principal.

TERRE HAUTE, IND.
ROSE POLYTECHNIC INSTITUTE.—A School
of Engineering. Well endowed, well equipped depart-
ments of Mechanical and Civil Engineering, Electricity,
Chemistry, Drawing. Extensive Shops & Laboratories.
Expenses low. For catalogue address T. C. Mendenhall,
Pres.

Brokers and Auctioneers.

R. ELLIS & CO.

BUSINESS, HOTEL AND PATENT BROKERS,
AUCTIONEERS, ETC.

No. 176 BROADWAY,

Room 46. New York.

CLIENTS Advised free of charge.

J. P. TRAVER & CO.,

General Auctioneers,
Real Estate and Business Brokers,
OFFICE, 23 PARK ROW,

OPPOSITE POST OFFICE, (ROOMS 14 & 15.) New York.

Mortgages Foreclosed. Cash Advanced on Consignments.
Property of Every Description Bought, Sold
and Exchanged.

Scientific Apparatus.

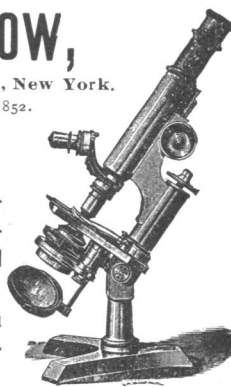
J. GRUNOW,

621 Sixth Avenue, New York.

Established 1852.

MAKER OF

Microscope Stands,
Oil Immersion Object-
ives and Abbe Con-
densers for Bacterial
and Histological work,
of Objectives, Camera
Lucida and other ac-
cessory apparatus.



IMPROVED OIL LIGHT MAGIC LANTERNS.

Also Lime and Electric Light Apparatus, and
mechanical, plain, and fine colored views.

J. B. COLT & CO., Manufacturers,
No. 16 BEEKMAN STREET, NEW YORK.

MAGIC LANTERNS Stereopticons and the Best Views
for Public, Church, Home, and
Scientific Exhibitions. Best appa-
ratus, new views. Largest stock. Reduced prices. 24
Years' Practical Experience. Illus. Catalogue Free.

GEO. H. PIERCE,
136 S. Eleventh St., Philadelphia, Pa

ELECTRICAL TESTING BUREAU,

Johns Hopkins University, Baltimore, Md.

Resistance Coils and Boxes Compared.
Am meters and Volt meters calibrated.
Condensers standardized.
Primary and Secondary Batteries Tested.
Efficiency of Dynamos and Motors Deter-
mined.
Insulation of Cables and Wires Tested.
Etc., Etc.
Circulars describing Methods Used, Prices,
Etc., sent on Application.
Address as above.

MORRIS EARLE & CO.

SUCCESSORS TO

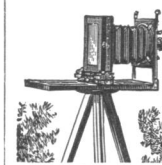
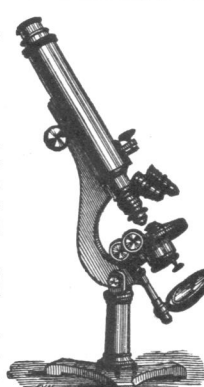
R. & J. BECK,

1016 Chestnut Street Phila

Microscopes and all
Accessories and Ap-
paratus. Photograph-
ic and Photo-Micro-
graphic Apparatus and
Outfits.

Spectacles, Eye
Glasses, Opera and
Marine Glasses, etc.

Illustrated Price List
mailed free to any ad-
dress. Mention SCIENCE
n corresponding with us.



E. & H. T. ANTHONY & CO.
591 Broadway, N.Y.

Manufacturers and Importers of
PHOTOGRAPHIC INSTRUMENTS,
Apparatus and Supplies of every
description. Sole proprietors of
the Patent Detective, Fairy, Nov-
el, and Bicycle Cameras, and the
Celebrated Stanley Dry Plates.

Amateur Outfits in great variety, from \$9.00 upward.
Send for Catalogue or call and examine. More
than 40 years established in this line of business.

WHITALL'S PLANISPHERES OR DI-
RECTORY OF THE STARRY HEAVENS
name and locate all Stars, Constellations, and
Planets visible at any given minute of time.
Should be used by every one. Ask your sta-
tioner, or address WM T. COOPER, Manager,
307 Race St., Philadelphia, Pa.

Readers of Science

Corresponding with or visiting Advertisers
will confer a great favor by mentioning the paper.

TO EMPLOYERS.

Having purchased the fixtures, good will, &c., of
the NEW YORK EMPLOYMENT BUREAU, at No.
681 BROADWAY, in this city, we request the pa-
tronage of the public in the future. We desire to
fill a long-felt want for an employment bureau,
where only the best grade of male help is dealt in,
and it is our aim to send ONLY such help as is or-
dered in every instance, and our patrons can rely
on us to send strictly first-class help, the references
of whom we personally investigate before sending
to any one. We simply request a trial, and are con-
vinced that we will give satisfaction in every case.
We have on hand help in every branch, which we
can send upon receipt of telegram or letter, and
FOR WHICH WE MAKE NO CHARGE TO AN EM-
PLOYER.

NEW YORK EMPLOYMENT BUREAU,
(AS REORGANIZED).

Arnold, Constable & Co. SPRING STYLES DRESS FABRICS.

Plain and Hair-Line Batiste Cloths,
Printed Laines, Fancy Mohair,
Cheviots, Tweeds,
for Steamer and Travelling Dress.
Checked and Striped Suitings,
Broche and Embroidered Robes,
Cashmeres d'Ecosse. Henrietta Cloths,
IN NEW COLORINGS.
FOR STREET AND EVENING WEAR

Broadway & 19th st.
New York.

GINGHAMS, SATEENS, & LAWS

Exquisite colorings are not confined to Silks. Cotton Dress Fabrics this season are more beautiful in design and shading than ever before.

The finest Scotch Novelty Gingham are from 18 cents to 60 cents per yard. Freres Koechlin's French Sateens, 30 and 35 cents per yard.

Printed Batistes 25 and 35 cents per yard; figured Lawns, all linen, 30 cents per yard; German Linen Dress Goods, plain, 35 cents, checks and Broche effects, 40 cents per yard.

Samples sent on request.

JAMES MCCREERY & CO.
BROADWAY AND ELEVENTH STREET,
NEW YORK.

SPECIAL TEACHER'S EXCURSION TO

PARIS EUROPE AND THE WORLD'S EXPOSITION,

visiting England, France, Germany, the Rhine, Belgium and Holland. All travel and hotels FIRST-CLASS. Finest line of Steamers crossing the Atlantic. Low Rates. Rooms are being rapidly taken. Send for circular, free.
E. TOURJEE, Franklin Square, Boston, Mass.

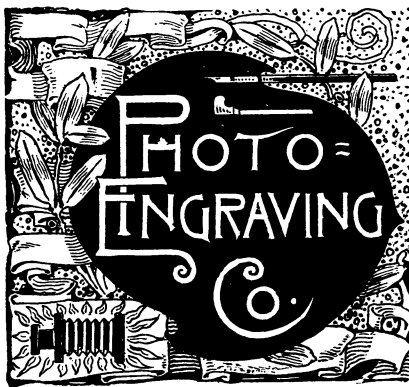
FOOD ADULTERATION

And its Detection. With photomicrographic plates and a bibliographical appendix. By J. P. Battershall. 328 pages, 8vo, cloth. Price, \$3.50. Circulars and Catalogues on application.
E. & F. N. SPON,
12 Cortlandt St., New York.



KIMBALL'S STRAIGHT CUT CIGARETTES.

Unsurpassed in quality.
Used by people of refined taste.
Highest award at Brussels, 1888.
The finest smoking mixtures are of our manufacture.
Fifteen First Prize Medals.
WM. S. KIMBALL & CO.,
Rochester, N. Y.



BRANCH AT 728 CHESTNUT ST.
PHILADELPHIA, PA.

JOHN HASTINGS =
Pres't.

A=R=HART =
Gen. Manager.

JOS=TRIPP
VPres't.

**ENGRAVING FOR
ALL ILLUSTRATIVE
AND ADVERTISING
PURPOSES**

67-71 PARK PLACE
NEW YORK

THE CHEQUE BANK LIMITED.

ESTABLISHED IN LONDON, 1873.

CHIEF OFFICE, 4 Waterloo Place, Pall
Mall, London.

TRUSTEES:

The Right Honorable JOHN BRIGHT, M.P.

The Right Honorable EARL BEAUCAMP.

Bankers: Bank of England.

The Capital of the Bank and its Guarantee Fund of 50% is invested in Government Securities.

The Bank does not discount Notes or Bills, nor speculate, but loans its Deposits against Government Securities, thus making the Cheque Bank Cheques EQUAL TO CASH—as Bank of England Notes are.

The Cheque Bank issues Cheques singly or in books from ONE POUND upwards, for the use of Travelers, and for others remitting money to Europe, available in every town in England, Scotland, Ireland, and Wales. In every town of Europe, and all other parts of the world.

Cheque Bank Cheques are accepted as Cash by all the British Government Offices.

VISITORS TO THE PARIS EXHIBITION this summer can get the Cheque Bank Cheques cashed at 50 Banking Houses in Paris.

Travelers and others holding Cheque Bank Cheques can have their mail matter addressed to them, care of the Cheque Bank, London, who will take charge of the same and forward to any address.

For Hand-Book containing List of upwards of 2000 of the principal Banking Houses throughout the World who Cash the Cheque Bank Cheques, and for all information, apply to the AGENCY,

CHEQUE BANK, Limited,

UNITED BANK BUILDING,

2 Wall St., New York.

E. J. Mathews & Co., Agents.

REFERENCES BY PERMISSION:

JNO. W. MACKAY, Esq., President Commercial Cable Company, Mackay-Bennett Cables, New York.

F. O. FRENCH, Esq., President Manhattan Trust Co., New York, and others.

KNABE PIANOFORTES.

UNEQUALLED IN

Tone, Touch, Workmanship and Durability.

WILLIAM KNABE & CO.

NEW YORK: No. 112 Fifth Av., above 16th St.

BALTIMORE: Nos. 22 and 24 E. Baltimore St.

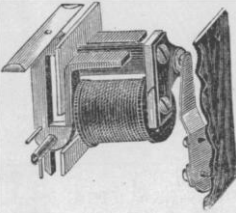
WASHINGTON: No. 817 Market Space, Penn. Av., near 9th St.



GOOD NEWS TO LADIES.

Greatest Inducements ever offered. Now's your time to get up orders for our celebrated Teas and Coffees, and secure a beautiful Gold Band or Moss Rose China Tea Set, Dinner Set, Gold Band Moss Rose Toilet Set, Watch, Brass Lamp, or Webster's Dictionary. For full particulars address
THE GREAT AMERICAN TEA CO.,
P. O. Box 289,
81 and 83 Vesey St., New York.

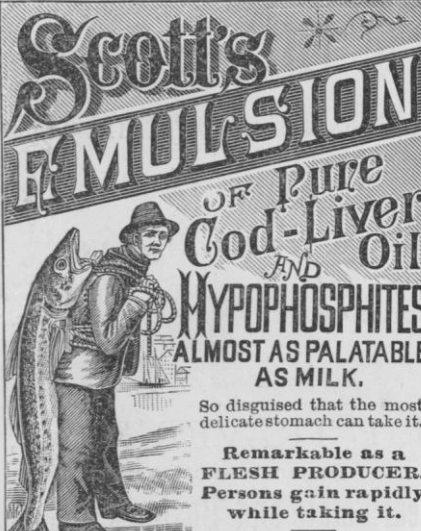
A ★
DROP
IN THE
PRICE
OF ★



GRAVITY
DROP
ANNUNCIATORS.

DON'T FORGET THE
DUST-PROOF BELLS.

HAZAZER & STANLEY,
32 Frankfort Street, N. Y.



**Scott's
EMULSION**
OF Pure
Cod-Liver
AND Oil
HYPOPHOSPHITES
ALMOST AS PALATABLE
AS MILK.
So disguised that the most
delicate stomach can take it.
Remarkable as a
FLESH PRODUCER.
Persons gain rapidly
while taking it.
SCOTT'S EMULSION
Is acknowledged by Physicians to be the FINEST
and BEST preparation of its class for the relief of
CONSUMPTION, SCROFULA, GENERAL
DEBILITY, WASTING DISEASES OF
CHILDREN, and CHRONIC COUGHS.
ALL DRUGGISTS. Scott & Bowne, New York.